INDUSTRIAL PHOTOGRAPHY

1961 AVERAGE MONTHLY CIRCULATION: 33,400

AN IN SPACE

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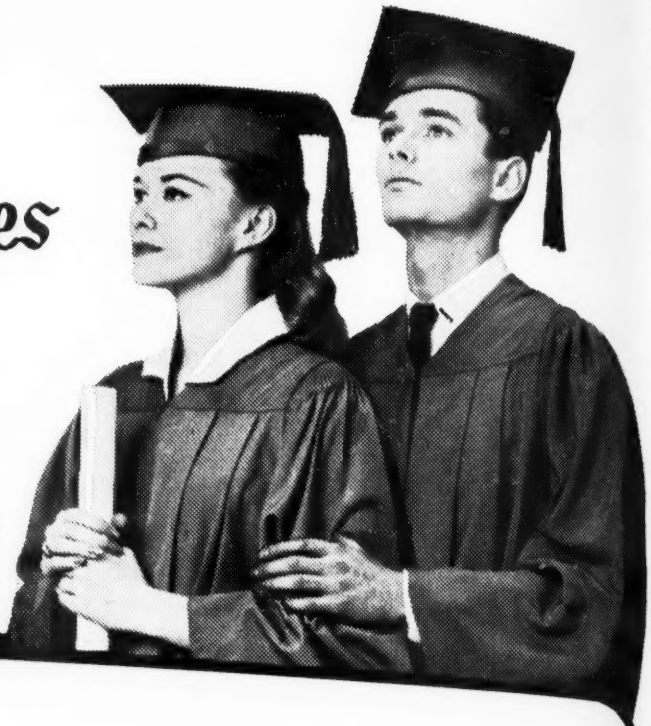
...Our Future And Our Achievements Are Clearly in Focus.



They look back on the years of learning that have brought them to the successful completion of their formative years. We look back on the years of hard work which has brought us to the undisputed leadership of the photographic industry. They look ahead to challenge . . . to hard work . . . to every-day problems to be met and overcome. We too look ahead to new challenges, firm in the conviction of our ability to serve our customers . . . dedicated to the principles that have brought us past successes as Michigan's largest independent photographic supply house.

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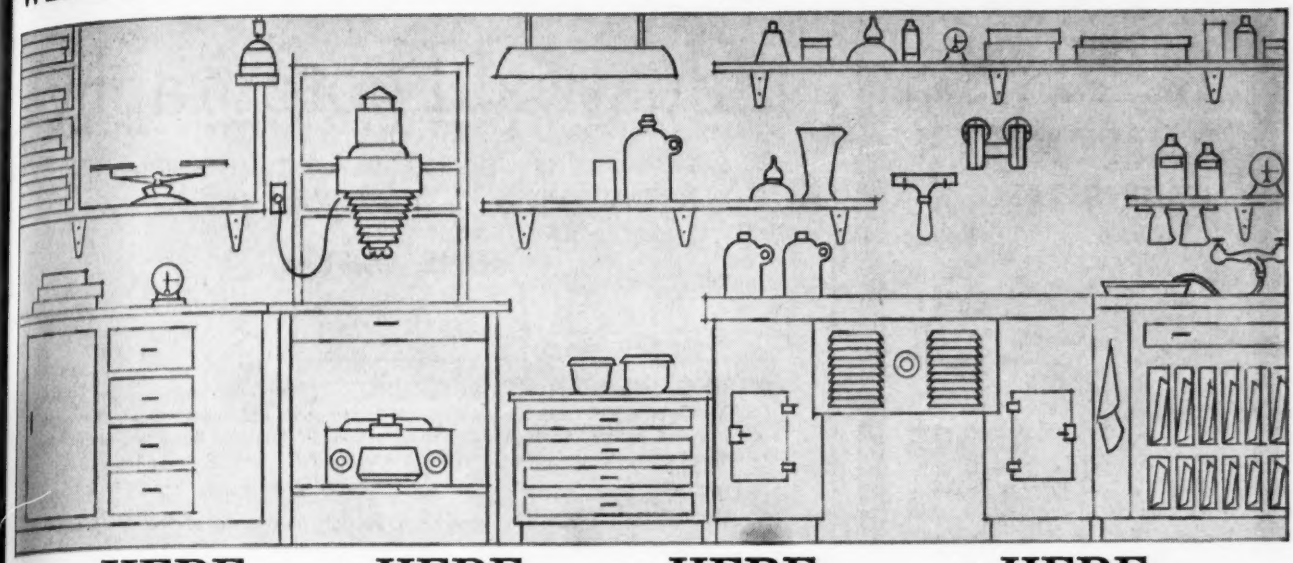
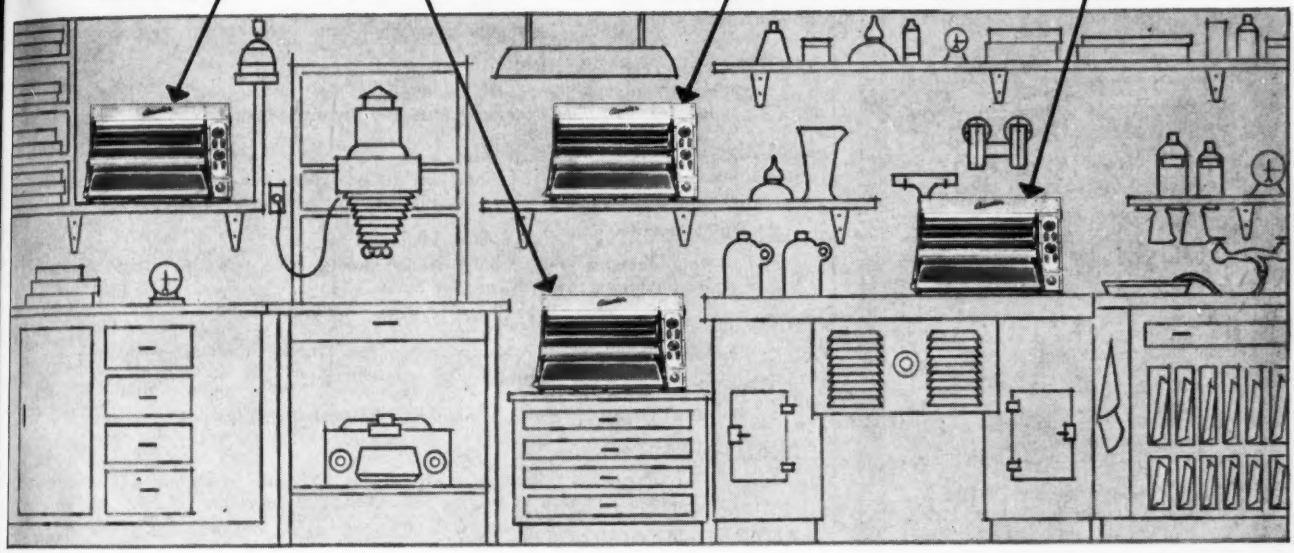
WHERE IN THE WORLD can I put an automatic dryer?



HERE or HERE or HERE or HERE



If it's a Beseler Automatic Rotary Dryer

The smallest "BIG" dryer made—

- Needs only *2 feet* of shelf space
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- Takes prints 16 inches wide
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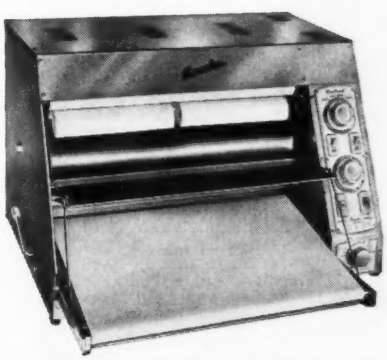

The 1217K Beseler Automatic Rotary Dryer

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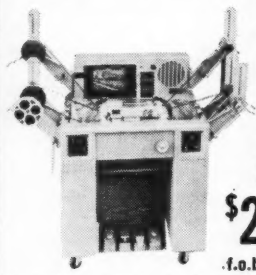

Makes Editing Easy!

Prices are in line—complete 2 channel unit

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Operation of this simple, efficient editing machine can be mastered in minutes. Continuous movement provides absolute safety for your film. Instant controls and declutching allows up to 50% increase speed and efficiency in editing. Any combination of 2 or 3, 16mm or 35mm channels, plus magnetic and optical sound available.

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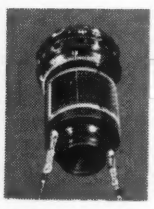

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New, imported director's viewfinder with large, clear optics in 4 new models at very reasonable prices.

Model I—for 35mm, range 25mm-135mm	$49.50
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FREE —Neckchain and Leather Case with Order **!**

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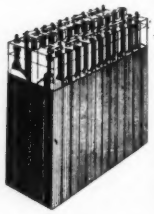

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Industrial Photography

THE MAGAZINE SERVING IN-PLANT TECHNICIANS
IN BUSINESS, INDUSTRY, GOVERNMENT AND SCIENCE

JUNE 1961

MAN IN SPACE

COVERING THE MAN IN SPACE SHOT 24
The flight which took Commander Alan Shepard 150 miles above the earth was one of the most photographed events in history. Read all about the techniques and equipment that were employed.

SUPPORT PHOTOGRAPHY 26
The story of the role photography is playing in support of the Air Research Development Command's space program is an exciting one.

HEADQUARTERS, SPACE COMMAND 28
NASA is the all-encompassing agency that coordinates U.S. space activities around the world. Naturally, photography and cameras do their share.

BOOSTING THE SATURN 29
America's top rocket expert, Dr. Wernher Von Braun, tells how photography is helping his group develop the mighty Saturn rockets.

CAMERA AS A RESEARCH TOOL 32
Man rides out into space mounted on a rocket. Behind the rockets are the researchers with their vital tool, photo-instrumentation.

CAL TECH'S JET PROPULSION LAB 34
Photographers at this distinguished scientific institution help it to function as an important research arm for NASA.

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INDUSTRIAL REPRODUCTION

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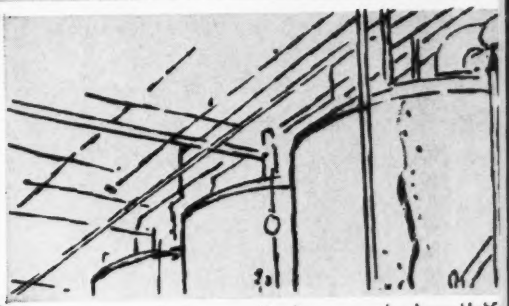
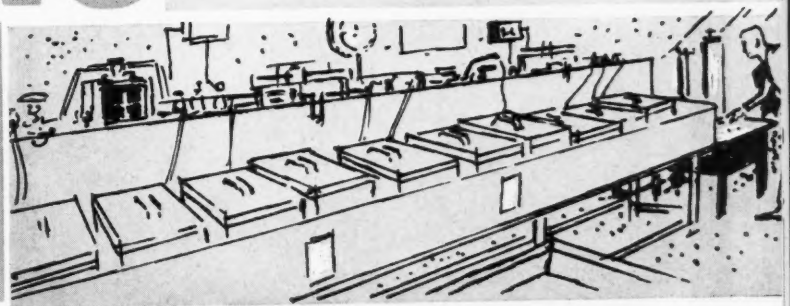
YOUR QUALITY CONTROL *BEGINS WITH WATER

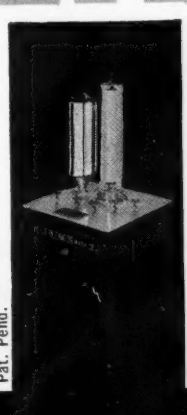




* When each step in your photographic processing checks out and you still find "bugs" somewhere along the line, check your water supply. This unsuspected yet critical phase of your system may be the villain. Here lurks unseen iron, copper, sulfur, algae, bacteria and other foreign matter which can contaminate the entire system, ruin hours of work, damage valuable film and paper.

Why take chances? Properly cleaned, purified water can mean the difference between high quality performance and inferior processing. The new, compact HEICO Rezinator Mark IV economically treats your water intake to assure quality control. Protect your investment, save time and labor with this simple, automatic system designed precisely to make your finished product the best.

Call, wire or write for bulletin describing the new HEICO Rezinator Mark IV and its successful applications in photographic processing.



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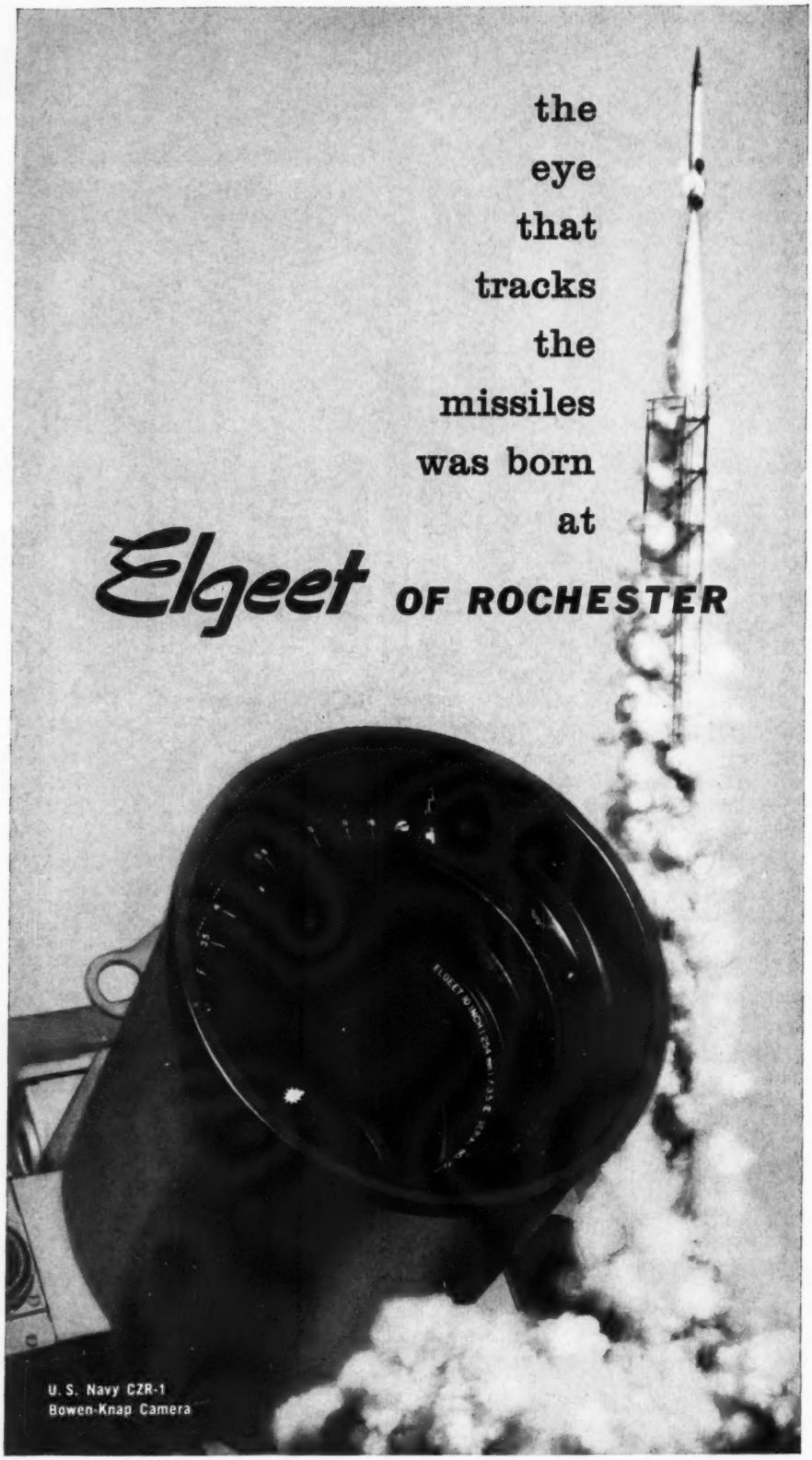

American missiles streaking through the ionosphere are followed in flight by the precision optics of an amazing ELGEET 10-inch f3.5 lens. Other ELGEET lenses... aimed at the face of space... pegging details of Earth's topography... or forming the video image for TV cameras are an important element in American industrial might. Let ELGEET lenses be part of your industrial or scientific achievements. ELGEET engineers gladly consult on optical problems with you. For further information, write to:

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All About The Cover Picture

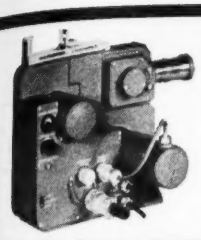
B. F. Goodrich, one of the many contractors helping NASA put a man in space, chose a national advertising campaign to publicize the part they played in the project. The logical thing was to picture an astronaut — which is just what they set out to do.

Photographing one of the real astronauts was out of the question — since it was difficult to get clearance from NASA—so Goodrich hired a model and decked him out in the full regalia at Langley Field. It took him a half hour to squeeze into the space suit which was ventilated by a hose pumping in refrigerated air.

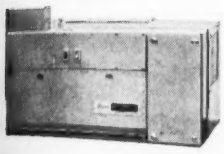
The background shot of the rocket was a 4 x 5 transparency obtained from Canaveral's files. Photographer Denny C. Harris shot the astronaut with a 4 x 5 Graphic view camera, lighting him with three spotlights covered with blue and orange theatrical gels.

Harris used Ektachrome (one second at *f*/11) for most of the photos although a few were shot on Ektacolor. The latter required shooting for one second at *f*/8.

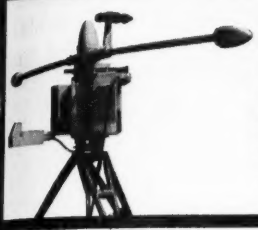
The final ad was reproduced from an Ektacolor print made from one of the Ektacolor negatives. An internegative was made from the background transparency and it was printed to scale with the head shot for a paste-up.



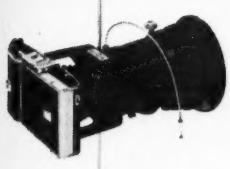
1 **HS401 High Speed Camera** Speeds up to 8,000 pps. Dynamic braking action for start-stop operation. 400′ capacity. 24 lbs.



2 **Mini-Rapid F316A Portable Film Processor.** Negative 16mm at speeds to 6fpm. Daylight loading. Self threading. Fully automatic control. 65 lbs.



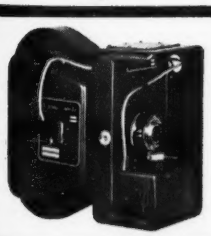
3 **Photographic Flight Analyzer** records flight data as a self-plotted photographic chart. Trajectories, takeoff and landing characteristics, verticals, horizontals, angles. Timing is measurable to .0005 seconds.



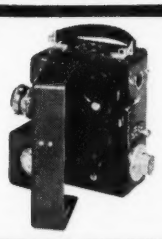
4 **F286 & F296 Oscilloscope Camera with Polaroid® back.** Gives permanent records in 2 to 10 seconds. Full size or half size prints.

5 **F-213 Motorized Processor** for 16mm, 35mm, and 70mm film. 100′ capacity. Motor removes for loading. All daylight operation except for film loading. Simple to operate.

6 **HS101 Camera** shown with HS504-C1 Top Speed motor kit. Drives at 8,000 pps. Magnetic braking and drag adjustment. Controls in separate miniature package.



7 **Fairchild-Camerz Camera.** 14 interchangeable film formats. Magazine load. Adjustable speeds. Rugged, lightweight, shock and weatherproof. Full line accessories.



8 **Fairchild-Siemens Recording Camera.** Cine 24fps. Stills at 8 per sec. to 1 per 24 hours. Shutter 1/30th to 1/150th second. Automatic or manual shutter.

PRECISION EQUIPMENT FOR PHOTO INSTRUMENTATION

Whatever your requirements, whether you need complete systems of equipment for high speed photography, or a portable film processor, or a camera for recording data displays or oscilloscope traces, a Fairchild product can probably fit your needs and your budget.

Fairchild has been engaged in the development and production of precision photographic instruments for more than 35 years. Its products serve the needs of science, business, industry, and defense in thousands of laboratories and plants across the country. Particularly notable is the Fairchild Mini-Rapid Processor, which has found application in almost every area of photo-instrumentation, especially where rapid delivery of the developed and dried negative is required for engineering test evaluations.

For complete technical data and prices of these products, we suggest that you check the information service form and mail it to us. Your request will be filled by return mail.

1	2	3	4	5	6	7	8

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY and STATE _____

FAIRCHILD CAMERA AND INSTRUMENT CORPORATION

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INDUSTRIAL PRODUCTS DIVISION

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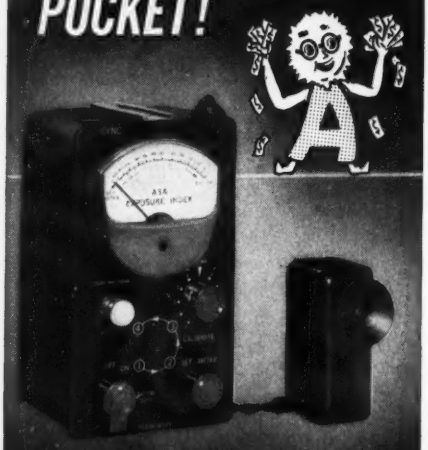

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ends costly waste of time and film... assures perfect exposures the first time...everytime!

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editor's mail

MITCHELL BADLER, *Editor*

Reader Help Requested

Your June issue with its basic theme of "Photography and Its Relation to Man in Space" should reveal how vital specialized training is to all the scientific and technical fields, especially in photography with its ever increasing role in the research, development and engineering phases of our space age efforts.

The Instrumentation and High Speed Photography Committee of the Society of Motion Picture and Television Engineers, in cooperation with other technical societies, is undertaking an intensive study of the curricula of American colleges and universities in relation to the requirements of industry and government for instrumentation and scientific photography. The desired end result will be committee recommendations acceptable to interested colleges for the establishment of courses or curricula that will be most beneficial to photographic specialists.

What the Committee needs is information on requirements in many other activities and fields, both from the individual and organizational standpoint. The readers of INDUSTRIAL PHOTOGRAPHY could do a great service by furnishing information for this educational program as requested in the questionnaire below. — Max Beard, Chairman Educational Sub-Committee for Instrumentation and High-Speed Photography, SMPTE.

INFORMATION REQUESTED FOR EVALUATION OF EDUCATIONAL REQUIREMENTS FOR PHOTOGAPHIC INSTRUMENTATION IN INDUSTRY AND GOVERNMENT

(For the sake of simplicity in answering this questionnaire, the term "photographic instrumentation" should include scientific, industrial, or research photography, photographic engineering or technology.)

PLEASE REFERENCE YOUR ANSWERS BY ITEM NUMBERS

Item (1) should be answered by technical photographers in photographic instrumentation.

(1) Do you recognize a need for college training in the physical sciences, mathematics or engineering for your particular work or group assignments? If so, please list courses of study, such as metrology, electronics, chemistry, etc. It would be helpful to know also the recommended level of advancement in each study, as for example, mathematics through calculus, etc.

Item (2) should be answered by engineers or scientists in photographic instrumentation.

(2) Do you recognize a need for college training in photographic optics, photographic chemistry, sensitometry, high speed or ultra high speed photography or other specialized photographic training for your particular work or group assignments? If so, please list the courses of study (or specialty) and a level of advancement if determinable.

(3) Do you, as an active worker in photographic instrumentation, have any recommendations for students in planning their curricula for careers in photographic instrumentation?

(4) Please indicate the field of endeavor most closely allied to your work, such as, research, engineering, industrial testing or other scientific and technical fields.

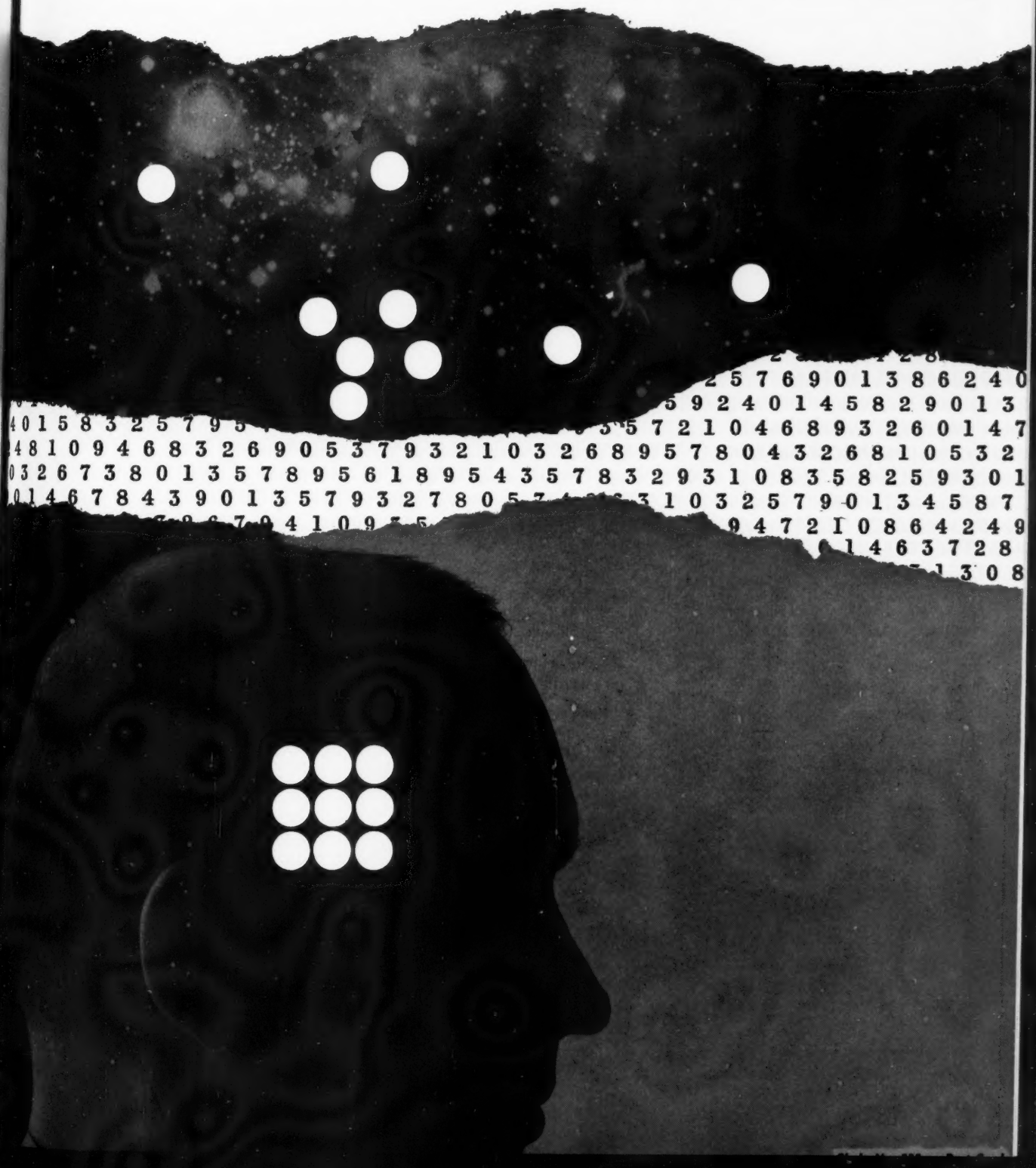
(5) Is your work primarily data recording, high speed photography, photographic equipment design, engineering of photographic systems, photo-electronics, photo-optics, or other forms of photographic instrumentation?

(6) What specialized training have you had in science, engineering, mathematics or technical photography applicable to your work in photographic instrumentation? If you have a degree, please state your major.

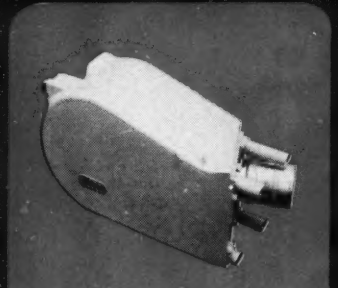
Although it is not essential that you identify yourself or your organization for this questionnaire, such information would be of value for further contact in specific cases. However, your name and organization would not be referenced in reporting except with your permission.

Please forward your reply to the Chairman of the Educational Sub-Committee on Instrumentation and High Speed Photography: Max Beard, 10703 E. Nolcrest Drive, Silver Spring, Maryland

IAI The major mission of reconnaissance specialists and photo interpreters is frequently that of resolving into essence ...es of unassimilated visual information for consequent military and scientific purposes. The Westwood Division's IAI system ...*formation acquisition* and *interpretation* links advanced electronic techniques with the superior visual sensing qualities of pho... ...phy to acquire, record, transmit, process, integrate, enhance, and—equally important—interpret intelligence information which ...efore has defied meaningful analysis. Inquiries will be given immediate attention. Scientists and engineers wishing to join in ...dvanced work will receive every consideration. Westwood Division, HF Houston Fearless Corporation, Los Angeles 64, Calif.



MILLIKEN CAMERA PHOTOGRAPHS ASTRONAUT SHEPARD IN SPACE!



PILOT OBSERVER CAMERA

Two Milliken 16 mm pulse cameras kept Astronaut Shepard and his instrumentation panel under constant surveillance throughout the historic Mercury spacecraft flight.

The two monitoring cameras, designed and manufactured by the D. B. Milliken Company specifically for the N.A.S.A. Project Mercury "Man in Space" capsule include:

Model DBM 7B INSTRUMENT OBSERVER CAMERA, film capacity 500 ft., 20,000 frames, 7¾ lbs., including film and lens.

Model DBM 8B PILOT OBSERVER CAMERA, film capacity 250 ft., 10,000 frames, 6¾ lbs., including film and lens.

Both cameras were designed to operate at 6 frames per second during launch and re-entry and 1 frame each 10 seconds during other portions of the flight.

Photo Instruments of Precision

For further information write:
D. B. MILLIKEN COMPANY
131 N. FIFTH AVENUE
ARCADIA, CALIF.

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European Newsletter

by MICHAEL J. LANGFORD

Weather Mapping Space Cameras

Michael J. Langford, who joins INDUSTRIAL PHOTOGRAPHY'S *ranks as European editor this month, has a varied background in all phases of photography. It includes three years with a leading English commercial studio, service with the Royal Air Force's Photographic Branch, experience with a London press agency and heavy industry in-plant departments. A Fellow of the Royal Photographic Society and the Institute of British Photographers, he is currently a full-time lecturer in industrial photography and industrial columnist for the British Journal of Photography. Michael will report on trends and techniques, equipment and exhibitions, as they appear in and as they affect Europe. Questions on industrial photography in Europe can be addressed to him c/o IP.*

Just under one quarter of the earth's surface is at present adequately covered by weather stations. Atmospheric conditions in one area have a decisive bearing on subsequent conditions over other regions of the earth, yet the meteorologist has little information about cloud build-up over ocean, desert and polar regions. An overall picture of this planet's atmospheric state, as seen from a satellite, therefore greatly advances man's uncertain art of weather forecasting. It also calls for an entirely new concept of photographic techniques.

Although meteorological space pictures have been taken from 100-mile-high rockets since 1954, man-made satellites provide higher, longer lasting and therefore more satisfactory observation platforms. However, it is then obviously necessary to devise methods of regularly relaying these observations to earth.

The 1959 Vanguard II carried some of the first experimental equipment to relay cloud-cover pictures. A photo-cell sensor was set to view the earth in line-by-line consecutive sweeps controlled by the spin of the satellite. Simple impulses representing cloud and ground luminosity were tape-recorded and subsequently transmitted when passing over a receiving station. This was intended to reproduce a mosaic of cloud distribution. In practice the spin rate of Vanguard II proved enough less than the design value so that the experiment washed out.

At best, photo-cell sensors are a comparatively crude method of picture recording. There is little doubt that for maximum resolution a suitable aerial camera forming optical images directly on photographic film is unsurpassed. Against this must be balanced complexities of on-board processing, due to the difficulties of regularly recovering exposed film.

Other disadvantages include the heavy screening necessary to protect unexposed film against cosmic radiation. Once processed and transmitted to earth by TV, the film would also form an unwanted 'passenger.' Despite relatively low resolution then, television cameras coupled to tape recorders seem a better proposition for space-high weather photography.

What are design requirements

continued on page 38

OPEN IN DAYLIGHT ONLY!

Gevaert STRUCTURIX

INDUSTRIAL X-RAY FILM

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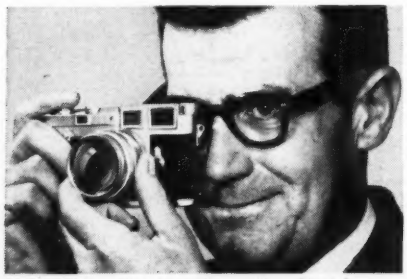
Most photographic problems are best solved with a rangefinder camera. But in certain instances, a reflex system may be considered preferable. With Leica's exclusive dual-system, you get the *best* advantages of both!

No other camera gives you Leica's precision and speed of rangefinder focusing...*plus* the ease and versatility of through-the-lens photography. And this dual system makes it quick and easy to switch from extreme wide-angle lenses (like the 21mm) for small,



Leica M-3 with 50mm Summilux f/1.4 lens

crowded areas... to extra-long telephoto lenses (like the 400mm) to bring those really distant shots right up close.

For reflex photography, the image seen on the ground glass of the Leica reflex unit is *clearer and sharper* than in any other reflex system. It's as if you were looking directly at an actual color transparency! The special low-light-absorption mirror in the reflex unit permits maximum light transmission for a brighter image. The exceptionally fine-grain, high-resolution ground glass facilitates sharper, easier focusing and viewing at night or whenever light is extremely dim.

When you want the superior accuracy and speed of a rangefinder, no other camera makes focusing and viewing so easy, even under the most adverse lighting conditions. The Leica has the brightest optical system of all rangefinder cameras. For rapid-fire shooting, when you want to get that one picture in a million, no other camera lets you focus so fast—so precisely! Leica's automatic parallax adjustment for any lens you use gets every shot, exactly as you see it! No other camera has Leica's system of *matched camera-lens* integration to assure you of absolute sharpness of detail.

And the Leica system gives you the widest latitude in rangefinder photography with its range of wide-angle lenses like the 21mm, 28mm or 35mm and longer lenses like the 50mm, 90mm or 135mm. In addition, the normal or longer focal length lenses can be used for extreme close-up macrophotography in conjunction with the Visoflex II.

Best of all, Leica's dual-system is your most economical choice, because it lets you take the fullest advantage of *all the equipment you now own.* For instance, with a bayonet adapter, any of your Leica-thread lenses can have unlimited use with the Leica rangefinder-reflex system of photography. You can photograph any size subject from any distance with a single camera—the kind of flexibility you've always wanted.

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Leica M-2S with Visoflex II and 65mm Elmar f/3.5 lens

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Circle No. 569 on Post Card

Condensing the Columns

INSTRUMENTATION 8

Cloud-cover photos relayed from satellites are daily becoming more valuable to meteorologists. This month Michael Langford tells how these pictures are made.

MOVIE CLINIC 12

Here are the how's and why's of color correction and how you can remedy badly exposed movie film in the darkroom.

INDUSTRIAL ROUNDTABLE 18

Guest columnist Clarence Hansen of Allis-Chalmers offers some unique ideas on how to sell management on photo services.

REPRODUCTION MANAGER 54

Denstman and Schultz, our reproduction specialists, tell you about a bag-full of inexpensive materials which make it a cinch to change and even originate professional-looking layouts.

About This Month's Cover

Turn to page 4 for a complete description of how the spectacular cover shot of the astronaut was pulled off.

MICRORECORDING 69

Don't know a microfiche from a microcard? ? Then this glossary of microfilm terms should prove an invaluable reference.

PATENT NEWS 82

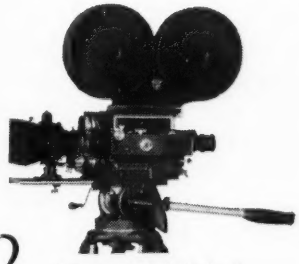
Do you have grounds for suing when someone starts making a replaceable part for a piece of equipment which you've patented? The answer should be of interest to photographers who create gadgets in their spare time.

7 reasons why Mitchell is the world's leading source for motion picture cameras

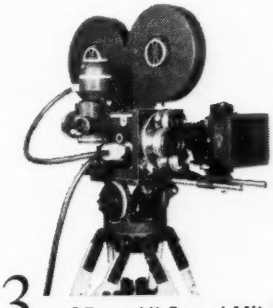
For over 35 years, Mitchell has held a unique reputation as *the world's leading source* for the finest in motion picture equipment. The reason — only Mitchell designs and manufactures a line of cameras to meet such a broad range of demanding professional filming requirements. Today Mitchell produces 35mm and 16mm cameras; 70mm 2¼ x 2¼ high speed cameras; and 70mm, 65mm and double frame aperture 35mm cameras.

There's a Mitchell camera designed to meet your requirements — write for information today.

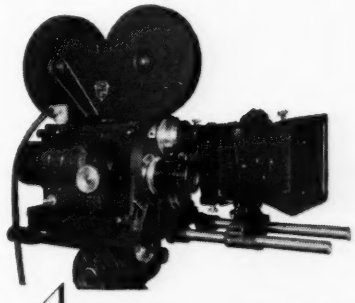
1 35mm Studio BNC Mitchell



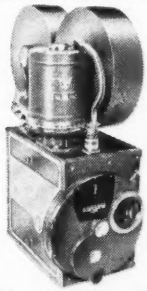
2 35mm NC Mitchell



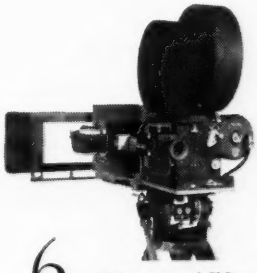
3 35mm Hi-Speed Mitchell



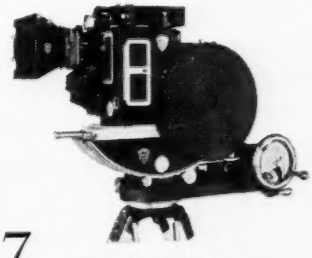
4 16mm Professional Mitchell



5 70mm 2¼ x 2¼ High Speed Mitchell



6 65mm and 70mm Mitchells



7 35mm Vista-Vision Mitchell

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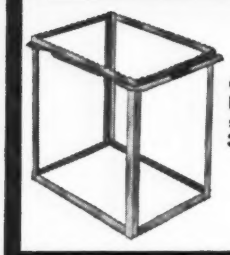

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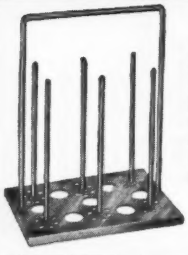

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What is Color Correction?

In 35mm a color negative is exposed from which 35mm color positives are made — either release prints or an interpositive from which is made the 35mm color internegative. To correct color, each scene is judged against a norm, with a color timer actually viewing how the scene would appear with the normal printing light, and with changes in color achieved by varying the proportion of the three primary colors. The color corrections, or changes, are then achieved in printing a positive direct from the camera negative. This system works rather well, and there is little occasion for review of the results.

In 16mm color we have a different situation. First, the stock exposed in the camera is a color reversal-positive film. The selected scenes of the processed camera film are usually edited in A & B rolls, to set up for the use of fades and dissolves in printing. From the edited A & B rolls may be made (1) direct reversal color prints or (2) a 16mm color internegative to be used in making color positive prints. In the first method, both camera and dupe stock are similar. In the second method, the negative-positive color duplicating stock is basically different from the reversal camera stock.

Color correction in printing is accomplished by the same basic method as in 35mm—by varying the proportion of light from the three primary colors.

The color may be altered between original film and dupe, by either of two basic methods know as *subtractive color printing* and *additive color printing.* The former utilizes a single light source in the printer and varies the color by inserting a filter in the light path. In effect, the filter serves to screen out undesirable color variations in the print. If the scene to be printed is too red, the filter will reduce the red values in the normal printing light, allowing more blue and green to come through.

Involve Color Correction

Each of the following has been referred to as involving color correction:

1. Normal timing and alteration of the volume of the printer light during the printing process — to lighten dark scenes, darken light scenes. The purpose is to achieve a more even exposure of the scenes in the print, and professional timing does result in a better looking print. But, it is not intended to alter color tones in printing.

2. The use of a single filter in printing a show edited from one emulsion, as recommended by the film manufacturer or indicated by laboratory tests, to achieve more normal and desirable over-all color balance in the print.

3. The use of a filter, or filters, to change the color duplication of a few scenes noticeably off-color. This may involve one to a half dozen or so scenes, scattered throughout the edited roll.

4. The use of filtered light in printing to affect the color duplication of every scene in the edited film. This is scene-to-scene color correction, each scene being judged for color in the same manner it is judged for density. □

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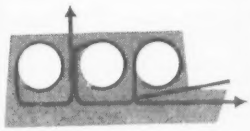

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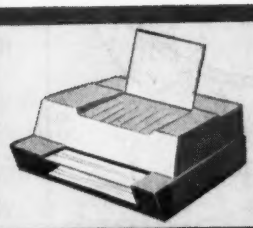

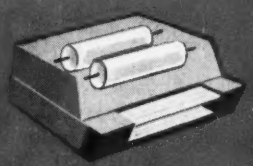

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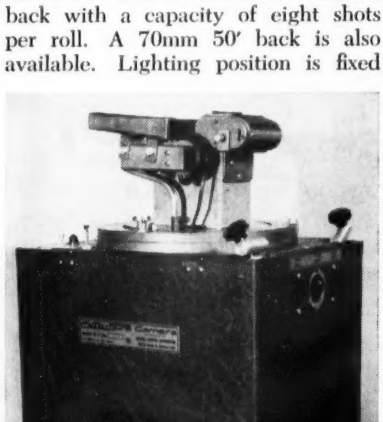
Bert Lefkowitz views the New Products

An easy way to keep posted. Each item featured below has a key number. For more information — without obligation — circle same number on Readers Inquiry Card (pages 89-90).

ID Device 101

A complete package designed for making identification badges or other documents with the subject's photo as an integral part has been announced by *Natural Lighting Corp.* The unit, called the Foto-Sure camera, measures 14″ x 14″ x 16″ and uses a small Polaroid back with a capacity of eight shots per roll. A 70mm 50′ back is also available. Lighting position is fixed



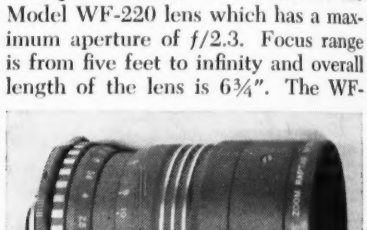
by brackets attached to the unit itself by means of telescoping arms. Within the camera is a copyboard which can be reached by a rapid access door for quick document changes. The subject is positioned approximately 5′ from the camera and his image is superimposed in the lower left of the print. Two 3″ *f*/4.5 lenses in the shutter are simultaneously tripped by a double release. An interesting feature of the camera is the pan and tilt adjustment which allows for perfect framing with subjects of varying height. Operation of the camera is also said to be "idiot proof." Price: $733 F.O.B. Burbank.

Editing Unit 102

A complete editing facility for motion picture film designed for high speed checking of prints is being offered by *Camera Equipment Co.* Called the Ceco High Speed Editing Table, the unit features rapid rewinds with a range to 250′ per minute in both forward and reverse. Braking action is almost instantaneous. The viewer is provided with a bright 4″ x 6″ screen and is equipped with a footage counter, optical head and an amplifier/speaker combination conveniently mounted. Speed and sound controls are located on the amplifier panel. The table itself is topped with formica and contains a drawer and film storage rack. Price: 16mm, $2,500.

Instrumentation Zoom 103

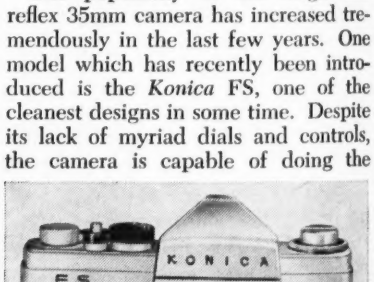
Wollensak Optical Co., maker of the Fastax cameras, has introduced a focusing zoom lens for use on its high speed cameras. Called the Vari-Focus, the lens will zoom from 28mm to 75mm and is said to give equal results at any point in the range. Resolution of better than 50 lines per millimeter is claimed for the Model WF-220 lens which has a maximum aperture of *f*/2.3. Focus range is from five feet to infinity and overall length of the lens is 6¾″. The WF-



220 should be useful in eliminating camera shifting since the test object can be enlarged or reduced to fill the frame from a fixed position. Price: $345.

Moderate-Priced SLR 104

The popularity of the single-lens reflex 35mm camera has increased tremendously in the last few years. One model which has recently been introduced is the *Konica* FS, one of the cleanest designs in some time. Despite its lack of myriad dials and controls, the camera is capable of doing the



finest work, thanks to the extremely sharp 50mm Hexanon *f*/2 lens and

continued on page 16

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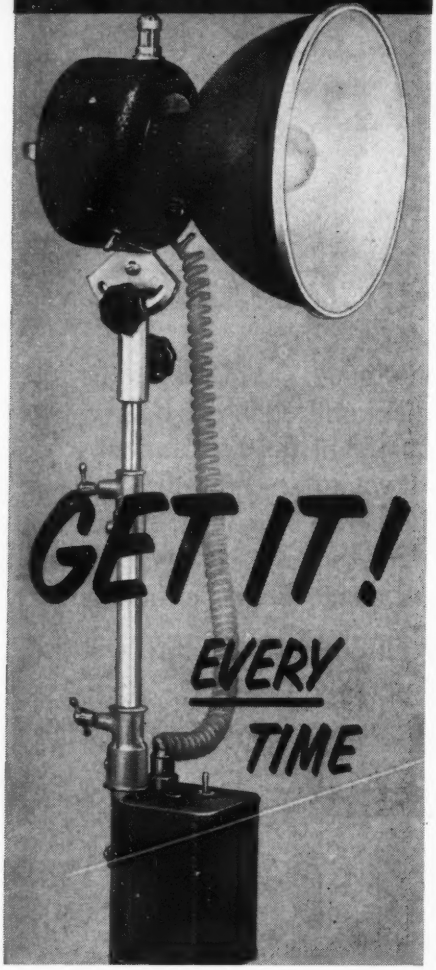

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NEW PRODUCTS

continued from page 14

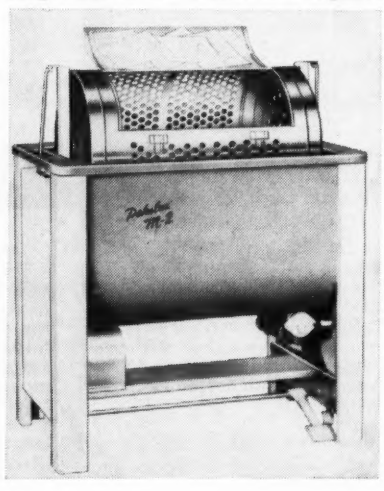
unique shutter. The shutter, which is all metal, consists of a series of thin slats that travel in the vertical, not horizontal dimension. This permits the entire negative area to be exposed in 7.5 milliseconds, which is claimed to be half the time required for conventional focal planes. This also helps to avoid distortion. Another excellent feature of the Hi-Synchro shutter is its ability to fire "M" bulbs at any speed up to its top figure of 1/1000 sec. No special adjustments to advance or retard the delay are required. If electronic flash is used, you can shoot up to 1/125 sec. This is especially useful with bright ambient light which can cause ghosts. The photographer who requires a wide variety of focal lengths hasn't been forgotten either. A whole battery of lenses from 35mm to 800mm is available or many currently marketed lenses from 24mm up can be adapted for the Konica FS. Other features include what you might expect in a quality SLR: instant return mirror, even illumination over the viewing area, bayonet mount, crank rewind and auto-setting frame counter. Price: $189.95; case, $15.95.

Low Distortion Lens 105

Goerz American Optical Co. has introduced a special Red Dot Artar 9½" *f*/9 lens designed for extremely low distortion in operation. It is corrected for a reduction ratio of 20:1 and has a distortion of 3 microns across the field of about 46 degrees. Applications for the unit include military display equipment, microminiaturization and reproduction of maps. Price: in barrel with iris diaphragm, $355.

New Model Washer 106

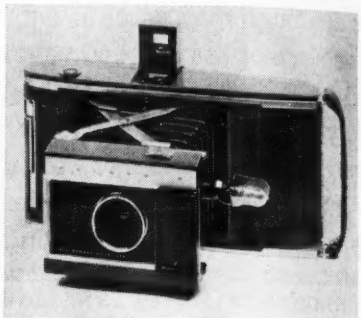
The popular Pakolux Print washer has been introduced in a new model, the M-2, by the *Pako Corp.* Among the features that differentiate the M-2 from the Standard is a reinforced fiberglass tank. This is said to add longer life to the washer and requires



a minimum of maintenance. Triple action washing assures clean, thoroughly washed prints. Capacity is 150 8 x 10 prints at a loading and the cost is comparably lower. The Standard Model is still available for those who prefer a stainless steel tank.

Fool-Proof Polaroid 107

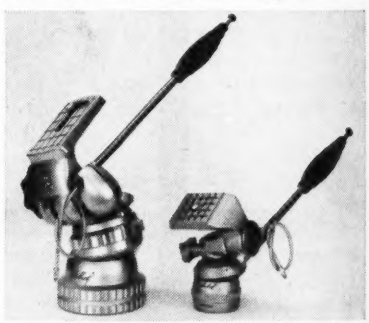
A fully automatic Polaroid Electric Eye camera, the Model J66, has been announced by the *Polaroid Corp.* The design, which emphasizes simplicity,



is ideal for use by field representatives and sales personnel. Operation of the camera has been broken down into four easy steps which are numbered on the body itself. Complete directions are also printed permanently on the rear of the J66 in just 49 words. A flash gun for AG-1 lamps is built into the camera standard and features a tiny reflector that swivels for bounce or regular lighting. Price: $89.50.

Tripod Heads 108

Kling Photo Corp. has added two new models of tripod heads to their line of Linhof Precision Tripods. The



Leveling Professional Pan Head is designed for 2¼" x 3¼" and 4" x 5" cameras. The Reporter Panhead handles cameras from twin lens reflexes down. Both feature full panorama and tilting adjustments and also have a special leveling device controlled by a built-in spirit level. Cable releases which operate through the panning handle are available as accessories. Price: Pro-Pan, $59.50; Reporter-Pan. $24.50.

Low-Cost Paper Cutter 109

Michael Lith Sales Corp. has introduced a low-cost paper cutter designed for added speed and safety.

continued on page 66

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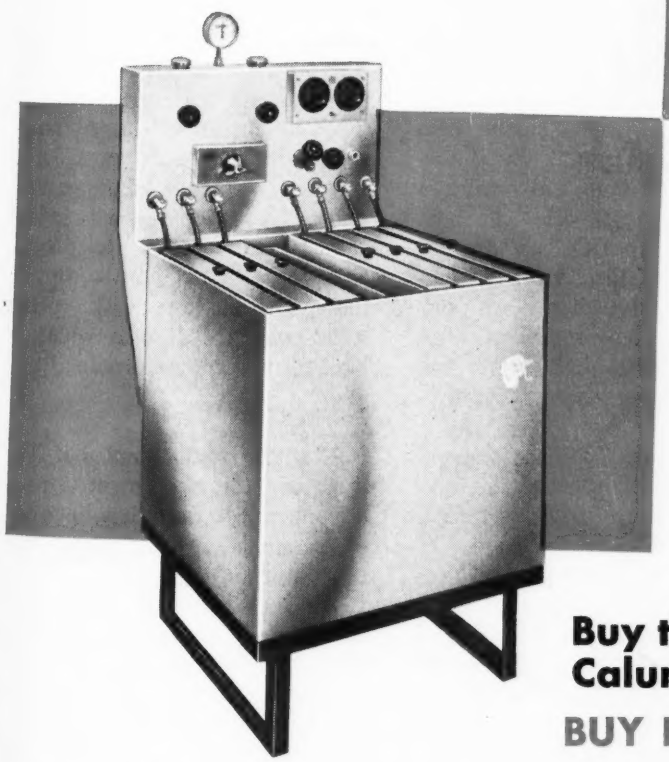

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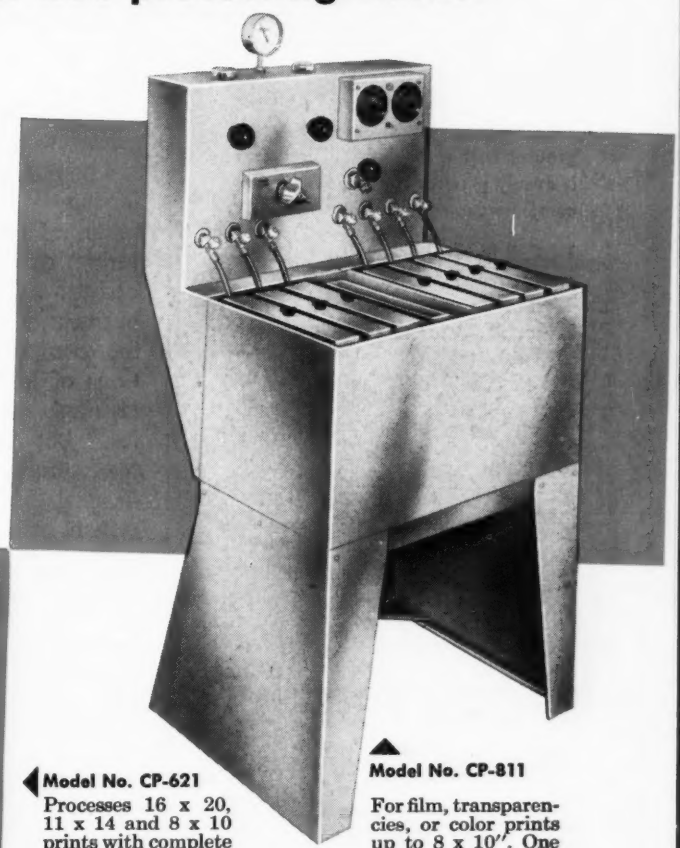

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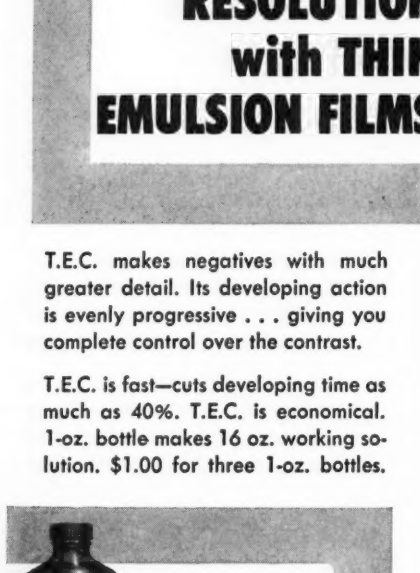

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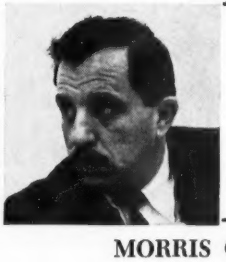


industrial roundtable

MORRIS GORDON, *Western Electric, Coordinator*

How To Sell Management on Photo Services

by CLARENCE HANSEN
Supervisor
Photographic Laboratory
Allis-Chalmers Mfg. Co.

Machines can do man's work only so far. Somewhere man's ability to create, to differentiate and to eliminate has to rise above metal, wood, glass and plastic.

HANSEN

I'm not referring to manufacturing, or the contracting business, or the computations of higher mathematics, but to photography — particularly industrial photography. As practioners of our art we are dealing with men in management who very well understand the difference between men and machines and just where to draw the line.

And perhaps it's just as well that the hard, firm hand of management on the tiller is preventing a good many industrial photographers from substituting machine perfection for creative perfection.

So, instead of selling management the idea of more and fancier substitutes for creativeness, sell the idea of increased use of industrial photographic services in which creativeness backed up by adequate equipment will work hand in hand to do more for management than it ever dreamed could be done via the darkroom method.

Don't try to sell management on buying photo equipment, sell them on photo services. I can't remember ever meeting another industrial photographer who did not sooner or later start griping about the trouble he has persuading the boss to buy him a new camera, enlarger or an electronic timer.

Photographers are gadget happy! Management, I know, is aware of this disease and tends to look upon any new request for equipment with a jaundiced eye.

I know of a newspaper that solved the problem. It simply gave its photo department free rein to buy anything the photographers needed — on one condition. No photographer was ever to be scooped by having competition come up with a better picture of the same event.

What a deal! Think or it! The paper promptly built a half-million-dollar photo lab. Every man had a great deal of equipment: slave units, strobe units, extension lights, large cameras, small cameras, sequence cameras, telephoto lenses and even special cameras to hold the telephotos. The paper finally had to provide the photographers with special radio-equipped cars in which to haul all this paraphernalia.

Put to Good Use

Don't misunderstand me. The men used this equipment to good advantage. In fact, they have one of the finest reputations of any newspaper in this country.

But, here's the gimmick. These same boys are now shooting pictures off the shoulder with one light on a Speed Graphic and getting better pictures than ever before. Why? Because they can now forget the mechanics of making a picture and can concentrate on creating a photograph.

To a newspaper, photos are one of the most important devices

for telling the news. It's half the business. But in industry, photography is a tool, just like a machine. If it can't make money, or help somebody make money, it had better be able to show that it is saving money somewhere. That's one reason we need to make our photographs count more and more.

Management feels, very often, that in the long run it's more economical and convenient to have staff photographers on the premises. In that way management can avail itself of all the extra services that such an arrangement brings.

Be Creative!

This means that the photographer is in a good position to sell management. So let's sell management. Let's be creative, let's use our heads on buying equipment, let's help other departments make money. Let's be good company men. Let's help the company prosper, because if it prospers, we'll profit too.

That brings us down to selling photographic services to management.

I firmly believe that no industrial photographer can call himself a master of the art if he cannot visualize in advance of snapping his shutter on any subject all the potential uses for the results of the assignment.

Surely, it is up to the person who orders the photo to specify what he wants it for. It's up to the photographer, however, to suggest or foresee other possible uses. In fact, in my experience, it's often because a photographer has had enough vision to work up several versions of the one picture that uses beyond those originally conceived were made of the photos.

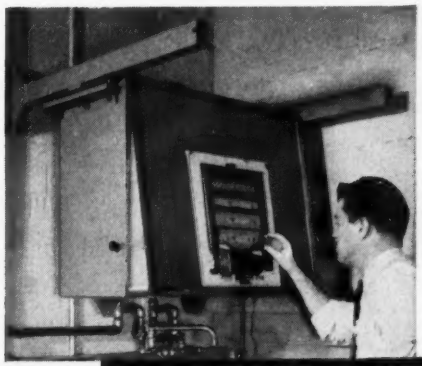
Industrial photographers complain perpetually: "They don't tell me what the photo's to be used for, and then they don't like what I take."

I believe that the photographer can overcome this problem to some degree, if he will come out of his darkroom long enough to learn something about the operations of his advertising, publicity, community relations, sales departments, and all the other users of photography. That's one way to perform like a company man. These departments use photos in many ways. Some can use photos that others reject.

It's basic in good industrial salesmanship that the salesman can do a better job in selling his product to his customer if he knows how it is to be used. The same is axiomatic in industrial photography. Look at all the uses for industrial photos: *advertising bulletins, advertisements, displays, engineering manuals, publicity in engineering publications, publicity in general publications, employee publications, engineering reports, direct mail, sales aids.*

continued on page 78

quick, safe inspection of negatives & positives



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IP CALENDAR

June 13-16 . . . Short course in photojournalism at Kent State University, Ohio.

June 20 . . . Special exhibit, clinic and film showing to be held by Arriflex Corp. of America, Hotel Benjamin Franklin, Seattle, Wash.

June 23-25 . . . Festival International de l'Image, slide competition sponsored by the Photo-Club at Epinal, France.

June 26 . . . Joint meeting of NEA Dept. of A-V Instruction and the American Association of School Librarians, Ambassador Hotel, Atlantic City, N.J.

June 26-30 . . . "Quality Control for the Graphic Industries," seminar at Rochester Inst. of Technology, Rochester, N.Y.

July 6-10 . . . PPC Western States Convention, Lafayette Hotel, Long Beach, Calif.

July 17-21 . . . 3rd Annual Visual Workshop, U.S. Dept. of Agriculture.

July 22-25 . . . NAVA Convention, Morrison Hotel, Chicago.

July 30-Aug. 4 . . . Nat'l Industrial Photographic Conference, Statler Hilton, NYC.

Aug. 7-11 . . . SPIE Technical Symposium, Ambassador Hotel, Los Angeles.

Aug. 20-26 . . . Univ. Film Producers Assn., 15th annual conf., Berkeley Campus, U. of California.

Aug. 21-24 . . . Biological Photographic Assn., 31st annual meeting, Pick-Congress Hotel, Chicago, Ill.

Aug. 21-25 . . . Winona School, Warsaw, Ind. Industrial Photographic Management Course.

Sept. 25-29 . . . Photojournalism Conference sponsored by the ASMP and Dept. of Journalism, U. of California at Berkeley.

Oct. 2-6 . . . SMPTE fall convention, Lake Placid Club, Lake Placid, N.Y.

Regular Meetings

Rochester chapter, SPSE, meets on the second thursday of each month . . . Industry Film Producers Association, *Los Angeles chapter,* meets the first wednesday of each month . . . Southern California Industrial Photographers gather every third tuesday . . . Industrial Photographers of America *(N.Y.-N.J.)* meet the second and fourth thursday . . . Rocky Mountain Industrial Photographers gather every fourth monday in Denver . . . National Visual Presentation Association convenes every second thursday in New York . . . *New York chapters,* SPSE, SPIE, SMPTE and SRE meet on the first wednesday, third thursday, second wednesday and third monday respectively . . . *Binghamton chapter,* SPSE comes together every third thursday, while S. California SPSE meets last monday and Cleveland SPSE meets first tuesday . . . Association of Federal Photographers has meetings every third Wednesday.

The Minnesota Industrial Photographers Assn. holds meetings the first Thursday of every month. However meetings will be suspended during July and August. For further information on the group write MIPA, 521 Rhode Island Ave., Minneapolis, Minn.

Industrial Photography

JUNE

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shop talk

Man In Space

Rarely has an editorial project excited INDUSTRIAL PHOTOGRAPHY's editors as has the compilation of the story of photography's part in helping to put the first U.S. "Man into Space." It has also served to dramatize to us the indispensable role functional photography plays in our industrial-scientific society and related importance of photographic technicians and scientists.

Technically photography is invaluable in communicating the causes and reasons for mechanical failures directly to engineers concerned. Often, as you will find on the pages of this issue, it has been the only source of clues to the mysteries that cloud our space horizons. In addition, accurate, factual film reports – the plain, unvarnished truth of space successes and space setbacks – play an incalculable service in keeping the entire missile effort in proper perspective among those to whom it is most important – from the President to the public.

But photography has fulfilled an even greater role in our space research programs. The success of these programs depends on total communication and integration of ideas, experiments and results. These have been accomplished, to the greatest extent, by still and motion pictures. Inter-contractor communication, inter-program communication, training sessions, all around briefings on problem areas, reports to congressional committees and information to the President were all provided pictorially. Film was the strong thread which stitched this complex, coast-to-coast concurrent effort together.

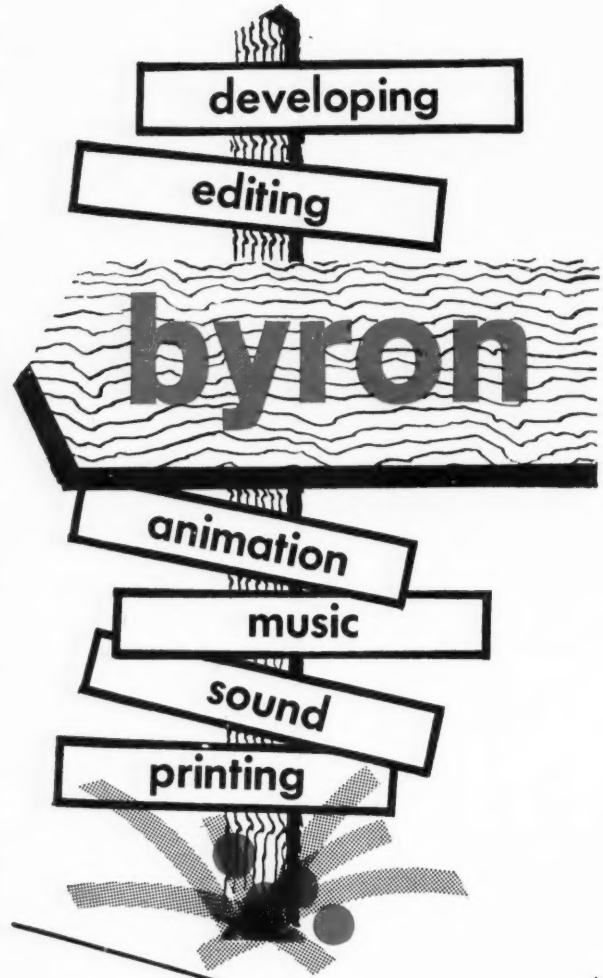
THE EDITORS

● Photo-instrumentation daily grows in importance as a research tool. Dow Chemical Company is one of photo-instrumentation's staunchest supporters and is backing its belief with a new unit that will provide specialized photographic services for research laboratories on a company-wide basis. Headed by R. Wayne (Dick) Anderson, who bears the title of research photographer, the unit will be part of Dow's Nuclear and Basic Research Laboratory. It will specialize in techniques such as high-speed and time-lapse photography, photocinemicrography, and photocinemacrography, and infrared and ultraviolet photography.

● *Other industrial photographers who have recently had changes in*

continued on page 83

wondering which way to turn?



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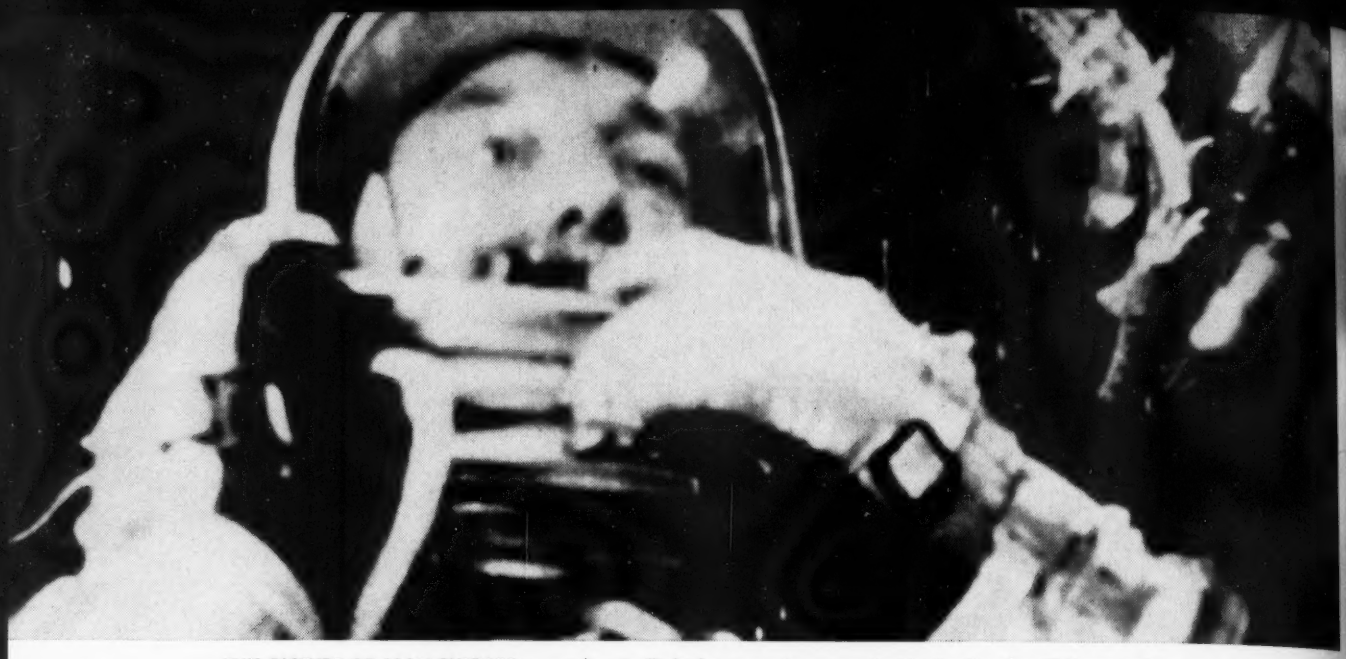
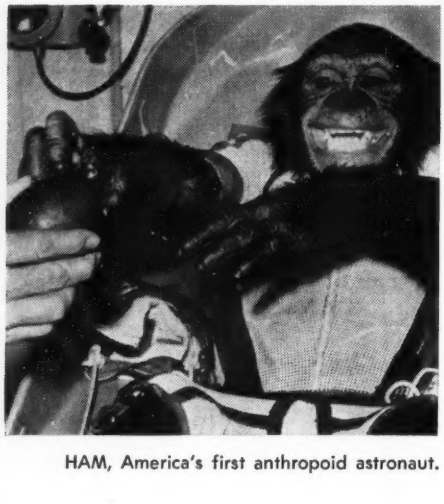
MAN IN SPACE



THIS PICTURE OF ALAN SHEPARD was taken in flight by a movie camera inside the Freedom 7 Spacecraft.



HAM, America's first anthropoid astronaut.

PROJECT MERCURY

The subject of one of history's most all-encompassing photography programs.

The flight of Navy Commander Alan B. Shepard, Jr. into space was the subject of one of the most comprehensive programs of photography in history.

Besides the huge battery of newsreel, TV and press cameras recording the event for the world, a massive array of documentary and test cameras covered every aspect of the Mercury mission from pre-launch preparation through the flight and on to post-recovery sessions. Performing the job for the National Aeronautics and Space Administration were 130 cameramen from the RCA Service Company employed to do photography at the Atlantic Missile Range, Cape Canaveral.

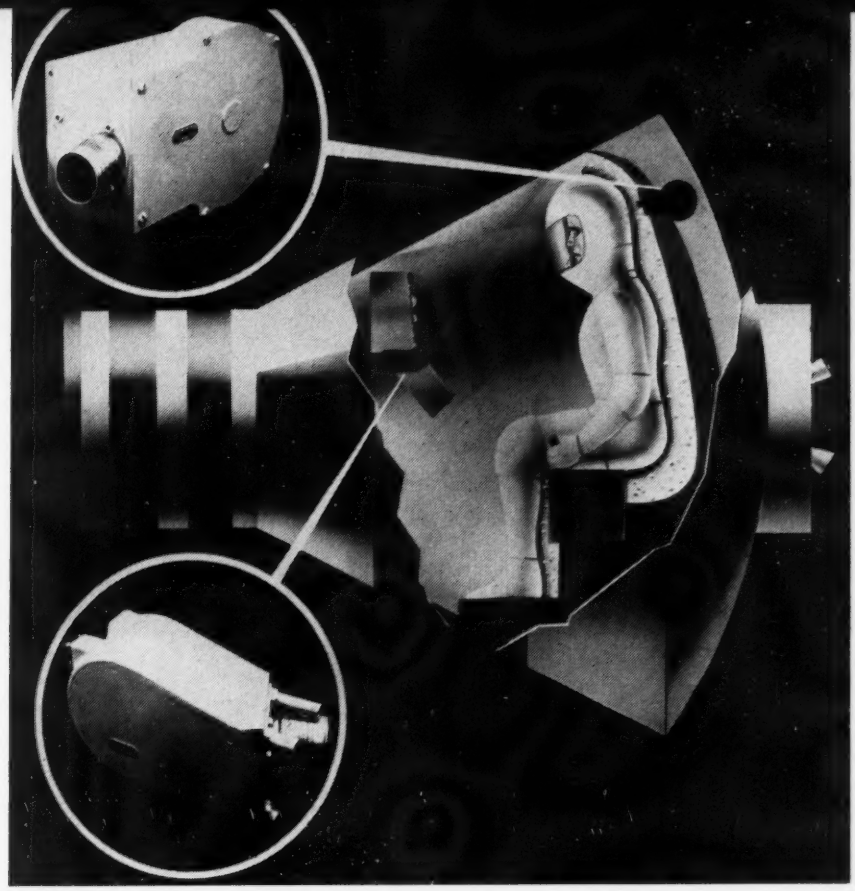
Operating on an around-the-clock basis — and utilizing 150 cameras of all types — they recorded in minute detail every phase of the Mercury preparations. Months of simulated tests in Hangar S and in a flight simulator in the Mercury Control Center were recorded as were test foldings of the parachutes and preliminary test flights such as that of Ham the chimpanzee.

Photographic coverage, however, reached its peak on the day of the launch. "Ring cameras" were located on the launching pad beneath the Redstone booster to capture the flaming thrust. Remote-controlled cameras were also atop the rocket vehicles service tower, recording the entry of the astronaut into his spacecraft. Other cameras — from Speed Graphics to high-speed motion pictures — at varying distances from the pad recovered every stage of the pre-launch procedures and the take-off.

In space, itself, photography rode along with astronaut Shepard. Two 16mm pulse cameras kept Shepard and the instrumentation display under constant surveillance while a 70mm "earth-sky" camera operated through the capsule's periscope.

A new film, Anscochrome FPC 132, specially developed for the space program, was used in the "Pilot Observer" camera, a Milliken DBM 8B. It recorded Shepard's behavior and reactions to weightlessness, exhilaration, etc. Detection of any skin color changes under such stress conditions was important and for this the film's minimum ASA rating of 200 proved valuable. The capsule interior was illuminated only by two neon tubes on either side of the astronaut. The DBM 8B had a 10mm *f*/1/8 Angenieux

VIEW OF THE EARTH taken on 70mm film by special J. A. Maurer camera from the Freedom Spacecraft #7. Alan Shepard saw this view at about peak altitude of his Mercury-Redstone flight down the Atlantic Missile Range.



CAMERAS designed and manufactured by the D. B. Milliken Company photographed the Project Mercury capsule instrument panel and Shepard's facial expressions during flight. Camera at top is mounted on seat to record instrumentation panel, while camera at bottom is mounted behind panel to record pilot's expressions. Instrument-observer camera takes 20,000 frames and pilot-observer camera takes 10,000 frames. Both cameras are 16mm, which operate at three frames a second during launch and re-entry and one frame every 10 seconds during orbit.

fixed focus lens set at the widest opening. Film-to-lens flange distance was modified to permit focus at a 26-inch subject distance. The camera was operated from a programmer. During launch and reentry it had a speed of three frames per second; in orbit this was reduced to one frame each ten seconds.

The "Instrument Observer" Camera was a DBM 7B and used DuPont double-perforated high-speed reversal "Cronar" base film. It, too, was triggered by a programmer and recorded the flickering lights and dials on the instrument panel at pre-set slow speeds.

The "Earth-Sky" camera that captured spaceman Shepard's "most beautiful sight" was a specially-designed 70mm camera, the 220-G, from J. A. Maurer, Inc. Shooting five frames per second on Anscochrome the camera can be operated by the astronaut or technicians on the ground. It had a long-focus *f*/2.8 lens and shutter capable of speeds up to 1/2000 second.

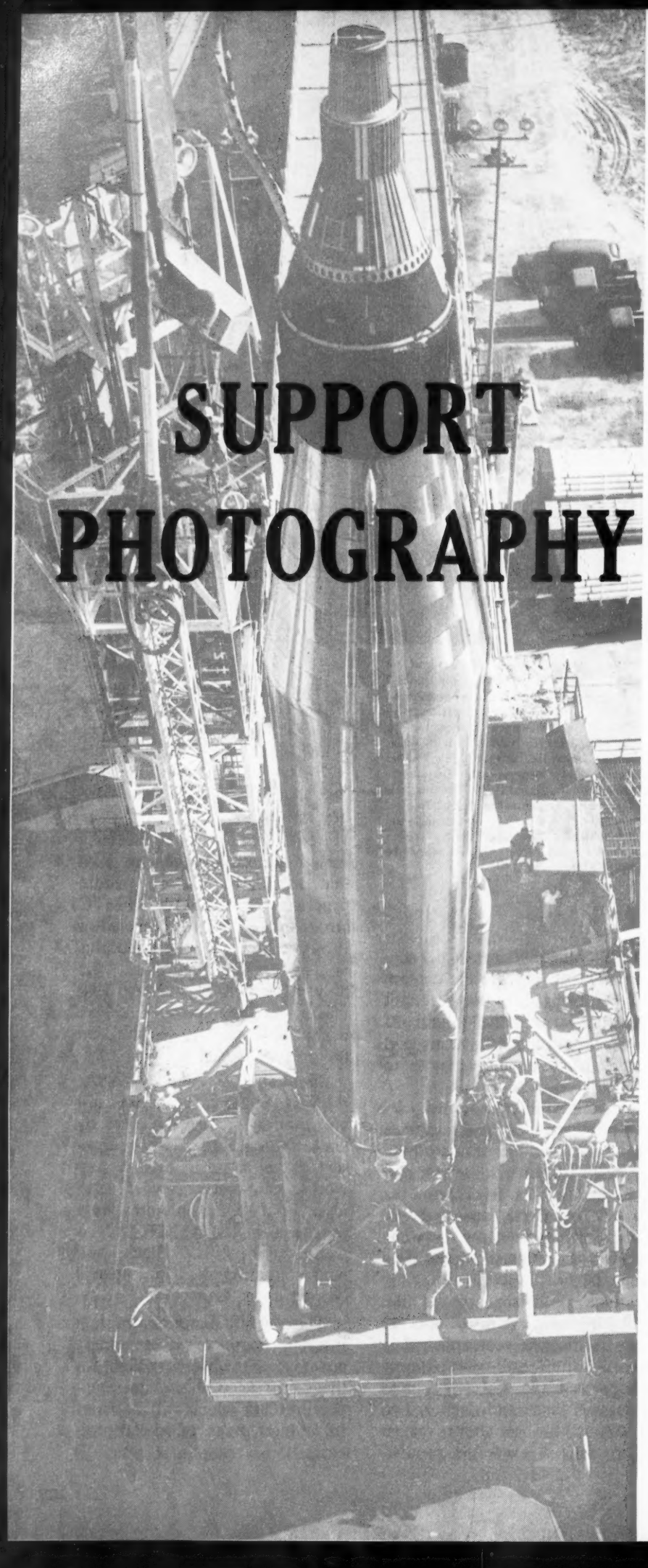
Range surveillance aircraft carried photographers to the capsule recovery area to continue coverage back on earth while tracking cameras (IGORs, ROTIs and the like) followed the capsule down. Teams of cameramen were waiting for Shepard at Grand Bahama Island.

Quick processing of all film shot for immediate distribution to news media was accomplished in record time. Still photography taken at Cape Canaveral was processed there and delivered to NASA within an hour except when volume exceeded production capacity. A total of approximately 7500 8x10 black and white prints and 450 sheets of 4 x 5 were printed. Stills taken at Grand Bahama and aboard aircraft were flown to the mainland for processing and delivery within a few hours.

Requirements for processing motion picture film were so great that the entire motion picture processing facility of the AFMTC lab (see page 40) was devoted to Project Mercury's 60,000-plus feet of film for three days. The only exception was Navy film (taken on the recovery ships) which was flown to Washington for processing.

Simultaneous with NASA-AFMTC photo coverage was still and motion picture coverage by pool photographers who represented the major television networks, newsreel and wire services. Pool motion pictures were processed in the AFMTC lab as were color stills. Black and whites were handled in a special lab set up at Canaveral.

The overall pictorial program insured complete documentary coverage of the Mercury flight for the world as well as vital engineering data which will be helpful in later, more advanced projects. □



SUPPORT PHOTOGRAPHY

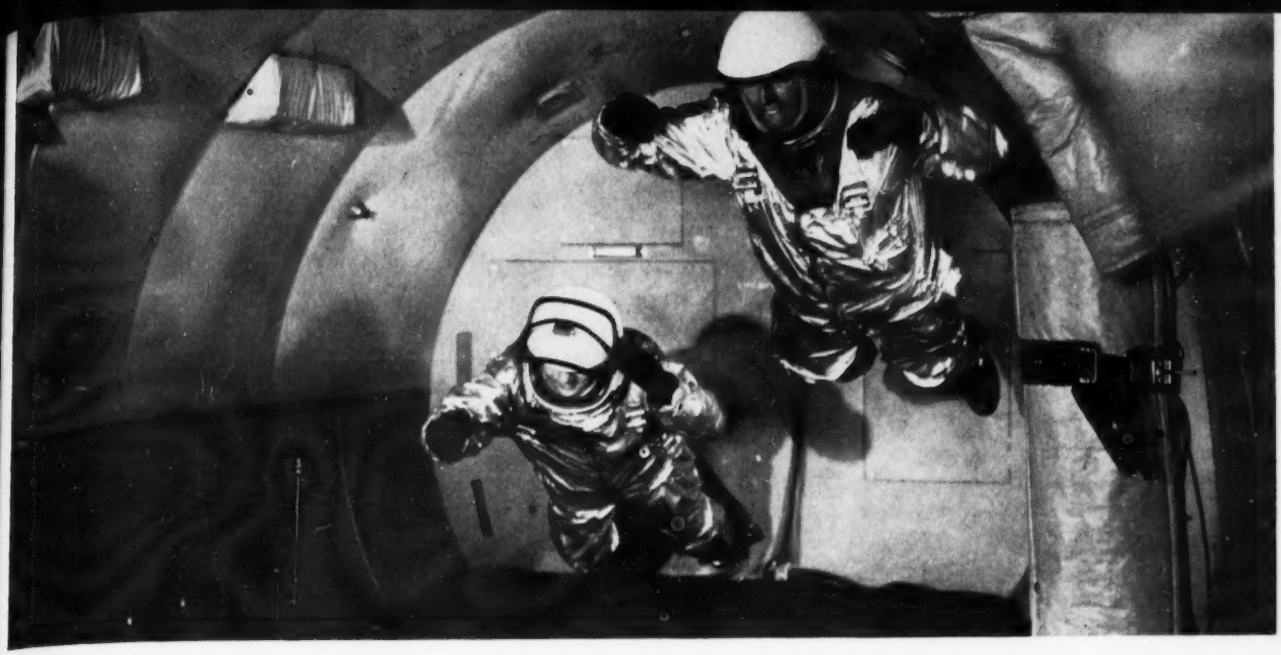
Wherever there is an Air Force research and development space program underway, there is a team of photographic technicians at work supporting it.

Cape Canaveral, Fla., May 5, 1961, T-minus 10 seconds . . . nine . . . eight . . . seven . . . six . . . five . . . four . . . three . . . two . . . one . . . a Mercury-Redstone III roars aloft, carrying Alan B. Shepard, Jr., America's first man in space.

This moment is many things to many people. Among them, it is a moment of culmination for applied photography. At this time and in this place are tied together projects at United States Air Force Air Research and Development Command posts scattered across America — all supported by photographic programs. The development of every major component in this historic flight from the astronaut himself to the Project Mercury Spacecraft has been monitored by the lenses and film of photo units at installations like the Wright Air Development Center in Ohio, or the Arnold Engineering Development Center in Tennessee. At the former the abrupt deceleration an astronaut might encounter was studied through high-speed sequence photographs taken with a ribbon frame camera at the rate of 120 exposures per second. At the latter a half-inch-diameter projectile was photographed as it traveled at a speed of 26,000 feet per second to provide aerodynamic design data.

These are but instances of photography's contribution to ARDC's space program. A complete catalog would fill a book — or several books. But perhaps a smattering of instances can give some idea of its size and scope.

At the White Sands Missile Range in southern New Mexico, extensive photo-optical coverage



FREE-FLOATING ASTRONAUTS under Zero "G" conditions were photographed with a 70mm camera.

is provided on balloon flights used in the study of payload capacities, methods of escape from space craft and space capsule recovery systems.

Photographic instrumentation on these flights is furnished by such unique instruments as the Recording Optical Track Instrument. This is a double-tubed photographic tracking telescope with focal lengths of 50 to 500 inches and dual recording cameras. These telescopes have provided excellent detailed coverage on such high-altitude recovery systems test objects as a one-inch diameter cable at a range in excess of 115,000 feet, an optical systems resolution of better than one second of arc.

Space position, rate of descent and event coverage have also been furnished on atmospheric research objects such as a one-meter sphere at 200,000 feet.

Photographic orbital data collection, configuration and reflectivity studies are provided by ROTI and such instruments as the Small Missile Telecamera, a large *f*/3.3 system.

Extensive space environmental testing of live subjects and equipment is conducted by the USAF Aero-Medical Laboratory at White Sands. Photographic coverage includes a multitude of high-speed cameras to provide speed profiles, acceleration and deceleration data and detailed subject effect information.

Photography renders its heaviest support to the space program at Cape Canaveral itself, where over 130 photographic technicians have been using up a half-million dollars' worth of film a year recording events leading up to the Shepard shot.

In all, some 372 cameras — from 35mm stills to wide-film sequential to high-speed movie cameras — are used at Canaveral. This vast array of apparatus is augmented by 2,500 lenses and other accessories, bringing to 4½ million dollars the value of the equipment employed by the Radio Corporation of America under a subcontract to the Air Force Missile Test Center at the Cape.

Put in simplest terms, it is the responsibility of the Cape's photo technicians to provide complete photographic coverage of every missile's life span from the time it arrives at the Cape until the time it disappears into the wild blue yonder. Most of that life span can be documented with more or less conventional photographic equipment and techniques. But the firing requires much more.

On the day of a launch, photographers start work at T-minus 180 minutes. High-speed 16mm Millikens and Fastaxes are set up close to the pad to record color ignition, mainstage flame and umbilical release. Outside the danger zone, 16mm Cine-Specials and wide-film sequential aerial cameras are readied. Some are mounted on 20- and 50-foot

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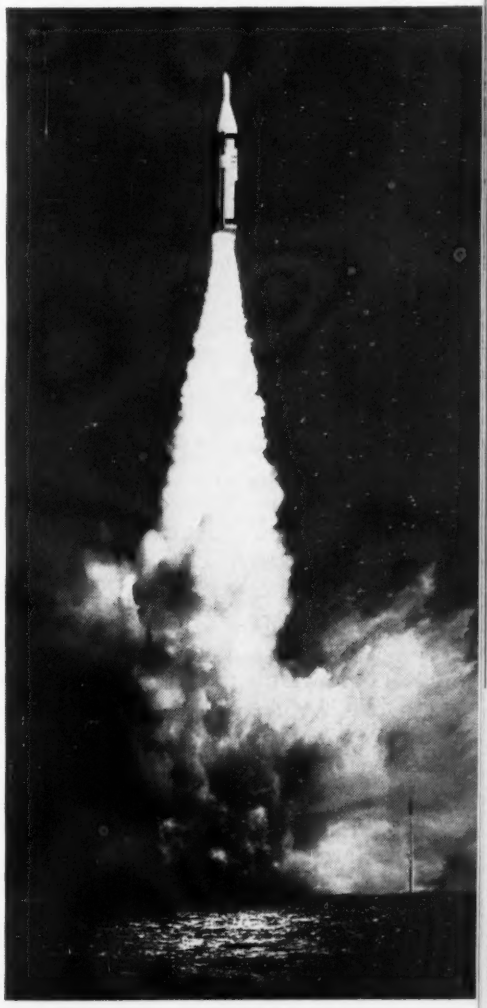

POLARIS MISSILE is frozen on film as it blasts out of sea. It was fired from the submarine, USS George Washington.

Headquarters, Space Command

by MITCHELL M. BADLER
Editor

A little more than three-and-one-half years ago the Space Age began with the launching of Sputnik I. Leading the U.S. efforts into space is a government agency not quite three years old, the National Aeronautics and Space Administration. Its stated objectives include:

"The expansion of human knowledge of phenomena in . . . space." "The development and operation of vehicles capable of carrying instruments, equipment, supplies and living organisms through space."

"The preservation of the role of the U.S. as a leader in . . . space science."

It will come as no surprise to the readers of INDUSTRIAL PHOTOGRAPHY that down-to-earth photography is helping up-in-the-air NASA achieve these aims.

The space agency maintains satellite tracking stations around the world, activities at twelve U.S. locations including seven research centers, and a Washington headquarters. Each installation makes extensive use of photography; the research centers offer complete photographic facilities to do everything from scientific studies to record reproduction. Radio Corporation of America

A good example might be the Lewis Research Center in Cleveland, Ohio. In the course of a single day's activity a photographer may be required to climb aboard a jet in the morning to supervise photography of zero gravity research. After landing his assignment could include photography in any of several wind tunnels, at a nuclear reactor or in any of more than a thousand research environments. If you ask what equipment he might use, the answer is a simple one: "Name the camera — still or movie — and we have either used it or currently have a model of it in our Lewis photo lab."

Washington Center

The situation is similar at the Goddard Space Flight Center outside of Washington, D.C. Still equipment includes Deardorff view cameras, Speed Graphics, Contaflexes and Rolleis. Motion picture cameras cover Cine Special, Arriflex and Fairchild high-speed models. The work load ranges from still shots (black and white and color) of equipment, satellites and data reduction complexes to high speed films of high-G vibration tests. Film reports — on a "crash" basis —are routine.

Photo activities at other NASA research centers such as Ames Research Center, Moffett Field, Calif., the Flight Research Center at Edwards, Calif., Langley Research Center at Hampton, Va. (where Project Mercury was developed), the George C. Marshall Space Flight Center (see pages 46 and 48) and the Wallops Island Test Station, Wallops Island, Va. follow the same pattern. Photo-instrumentation techniques of every variety (many of which are detailed in this issue) forward space research . . . audio-visuals speed personnel training (for example, in a flight simulation trainer a filmstrip of world geography goes by to familiarize astronauts with any location they might pass over) . . . documentary photos keep the public informed . . . film reports go to other government agencies . . . record keeping is done on microfilm . . . and information is distributed via photo-reproduction.

RCA Contractor

At Cape Canaveral, site of the historic Mercury launch and more ambitious space flights to come, missile photography assignments are handled by the Radio Corporation of America

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TYPICAL use of photos in exhibit set up by A-V Section of NASA's Washington branch.

Sending Up The Saturn

by DR. WERNHER VON BRAUN*

With the increased cost and complexity of modern space vehicles has come the need for more detailed studies of developmental tests and flight performances. For such study records, rocket scientists and engineers throughout the industry are depending more and more on photography.

At the George C. Marshall Space Flight Center, Huntsville, Alabama, cameras are widely used in support of our Saturn research and development program. These filmed records, by which engineers can study the results of tests of components and processes, are playing a vital role in readying the 1½-million-pound-thrust vehicle for its initial flight test late this year. The cost of each of the multi-stage Saturn rockets, including launching, has been estimated at $20 million.

High-intensity lighting, located in the assembly building of the Center's Fabrication and Assembly Engineering Division, permits filming of the actual step-by-step buildup of the clustered first stage of the Saturn, as well as the mating of its two inert upper stages.

As many as 60 motion picture and still cameras, directed at known critical areas, have been used to record eight engine static firings of the Saturn booster.

Television cameras, long used to relay pictures of static firings and launchings back to blockhouses, are coming more into use. One such system was employed in the first successful launch of the Mercury-Redstone rocket to show the path of the vehicle in relation to the earth and to view the separation of the Mercury spacecraft.

Built-in, recoverable cameras are also used to record the in-flight behavior of rockets. Cameras in the Mercury spacecraft, for example, provided scientists with an invaluable record of Astronaut Alan Shepard's reactions during his historic flight.

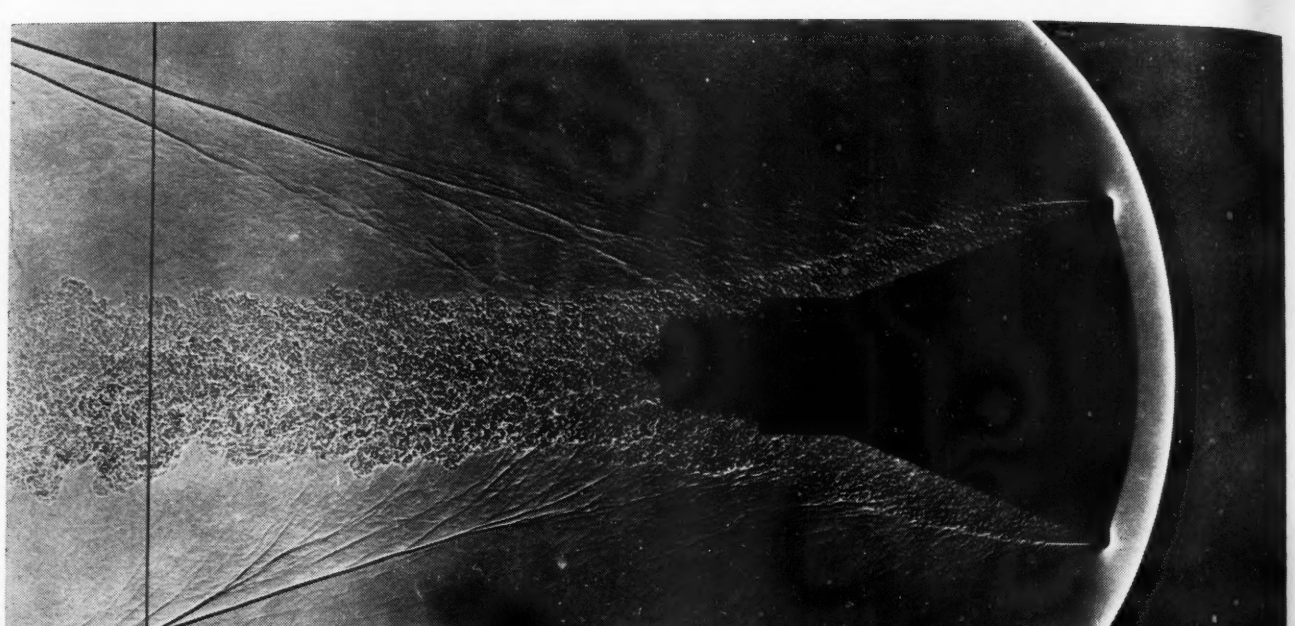
Finally, when the first Saturn is launched, camera crews using cameras operating at speeds over 8,000 frames per second will record in slow motion every event from ignition through actual flight. Full 360-degree photographic coverage will be given the rocket, with special cameras set up to record flame pattern, thrust and stress, recording for scientific study the valuable data that only cameras can provide.

Thus the camera is a partner with man in perhaps his greatest adventure — exploration of the universe — a valuable tool assisting him as he charts his course into space. □

DR. WERNHER VON BRAUN

SCALE MODEL of capsule is released into airstream of vertical wind tunnel at Langley.

As Director of the George C. Marshall Space Flight Center, Huntsville, Alabama, Dr. Von Braun is in charge of developing and launching the National Aeronautics and Space Administration's space vehicles.



MERCURY CAPSULE SHADOWGRAPH.

under contract to the Air Force (see page 24). However, NASA also provides photographic support for its projects at the Cape.

Here is the procedure followed. Six weeks prior to launch, NASA headquarters, Washington, writes up its PIO requirements as do all contractors. These go to the field center involved (in the case of Project Mercury it was Langley Research Center) which writes up an overall photographic requirement documentation, research, PIO, etc.) which is sent to the Launch Operations Directorate at the Cape. There the photo coordinator, who knows the locale better than anyone else, decides what cameras are needed at what position, what film to use, etc. He makes assignments and coordinates activities with other groups involved, in this case the Navy, Marines, Air Force and the RCA laboratory. For details on how the Mercury Flight was covered see pages 24-25.

Unlike the field centers which are "in-plant" in the fullest sense of the phrase, photographic activity at NASA's Washington headquarters is largely contracted outside. This is because it is basically a coordinating rather than research office. Yet, a wide range of photo activities are carried on.

All NASA audio-visual aids come from Washington. The Graphics branch handles everything graphic — slides, overhead transparencies, charts, etc. Art is done in-plant or contracted, depending on the job, but processing is done outside except for a limited number of viewgraphs run off on an Ozalid unit.

Publications and exhibits issued by NASA make extensive use of photography. This includes photos in exhibits and photo-offset preparation of brochures. The latter are done either at Langley's facilities (runs of 10,000) or the government printing office (larger runs). The usual procedure is initiation by NASA personnel, execution by a contractor and reproduction by either a government or contractor facility.

NASA Headquarters does have its own repro section, however, for short runs. Two multiliths, a photocopy unit and a copy camera are used to run off speeches, budget materials, internal memos, etc. All photographic material or large jobs go to Langley, GPO or an outside contractor.

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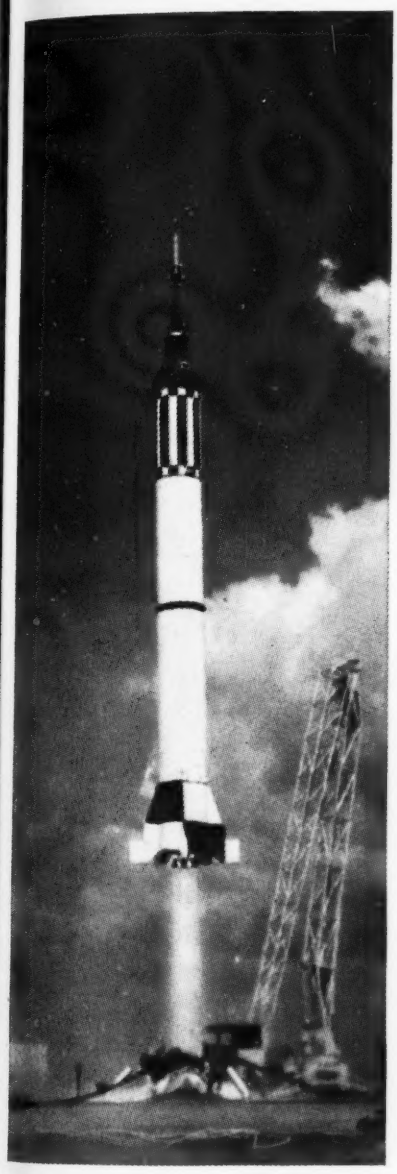
It was "A Okay" with Anscochrome

on America's First Space Flight



At Ansco we are proud to reveal that America's first name in high speed color film took a ride with America's first astronaut. A special ultra high speed Anscochrome® type film* made the first known photographic record of a man's reaction to space travel—a true record for the world to see.

Anscochrome film in the space age . . .

From the first laboratory tests and range firings to the final blast-off, the Anscochrome family of motion picture films have been serving the prime space contractors. Anscochrome, Super Anscochrome, and Anscochrome Professional Type 242 color films offer major advantages in missile range engineering recording and related types of cinematography. Here's why:

1. Highly accurate color rendition from the most delicate hues to fully saturated colors . . . Color accuracy essential to critical research.

2. Complete processing compatibility . . . Saves time and money by allowing the processing of all Anscochrome type films with the same chemicals on the same processing line.

3. Higher film speeds through forced processing when required . . . Permits otherwise impossible shots.

4. A notable exposure latitude to compensate for sudden shifts in lighting . . . Offers greater exposure reliability.

Whether the assignment is in-plant filming or down-range camera work, there is an Anscochrome type film of the correct speed and capability for best results.

** The 16mm ultra high speed Anscochrome film used is a special film made for the government missile program. Plans call for offering this ultra high speed color material to all industry in the near future.*

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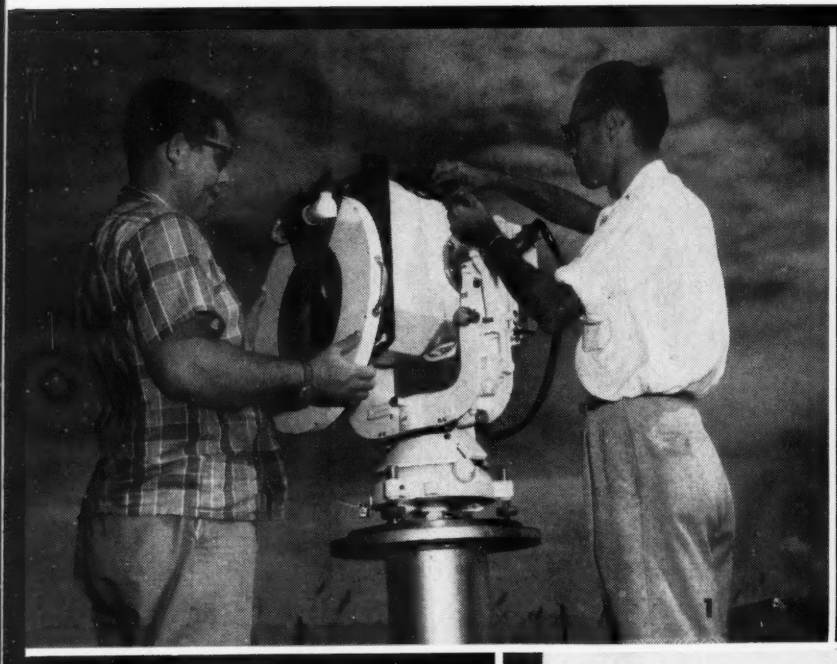

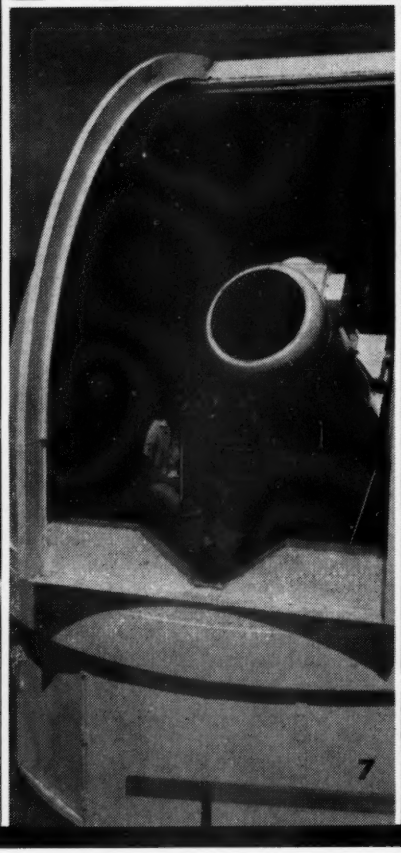

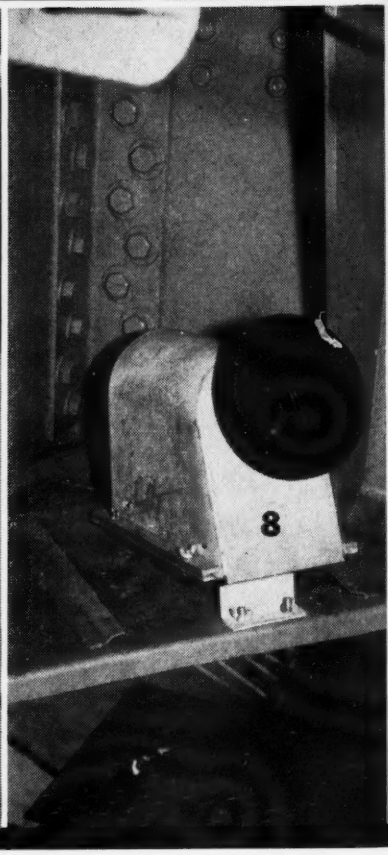

C-4 ballistic camera set up at ROTI site.
C-4 records strobe-flashes of TITAN at night.
STARS on glass neg. tell missile's location.
70MM FRAMES show missile's suicide—not murder.
WATHED Cine-Specials at umbilical mast.
ROTI 'monster' (7) made 70mm film record of
man second stage ignition (6).
MAINSTAGE IGNITION of THOR (9) is caught
Milliken camera in launching ring (8).

Vital Tool For Rocket-Building

The camera has proved invaluable as a missile research instrument at Canaveral.

by CARL N. BREWSTER
Head, Information Support Services
Atlantic Missile Range Office
Aerospace Corporation

During the early days of missile testing at Cape Canaveral — launching site of AFSC's Air Force Missile Test Center — catastrophic failure was expected to be the rule rather than the exception. Today, the reverse is true. An indeterminable but considerable amount of the credit for this turnabout is due to photographers and their equipment. Officers of the Air Force Ballistic Systems Division and Space Systems Division have become photography's heartiest proponents.

Very little of the footage shot at the Cape will ever qualify as prize material for a photographic exposition. But for the information these pieces of film have contained, for their definition of problem parameters, for the millions of dollars and millions of manhours they have saved, they are perhaps the most valuable films in the world.

Let's take a look at some of the many ways in which photography has created such savings, day after day. Let's start by taking an imaginary hop down to Cape Canaveral for the launching of a Titan. To all appearances it is a success, but engineers detect a flaw. Through telemetry the missile was supposed to tell them what it was doing all through the ride. Instead, it momentarily lost its voice. Why? To find out, they called on the longest "eye" on the range — a 500-inch lens which can identify the stitching on a baseball at eight miles! This is the ROTI (Recording Optical Tracking Instrument) located some 30 miles south of the launch site. *(See Fig. 7, P. 32)*

ROTI consists of a Photosonics 10A camera

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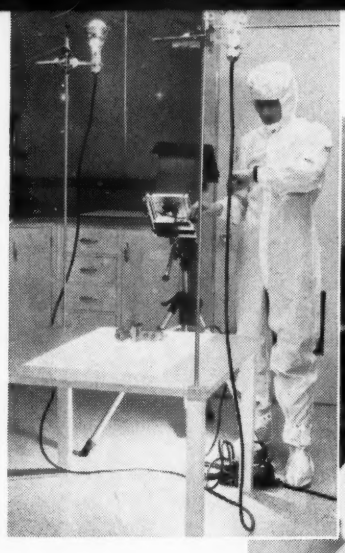
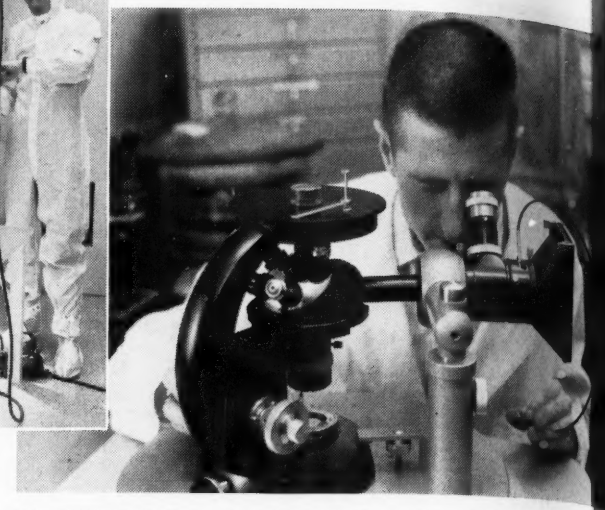
Cameramen at the renowned Jet Propulsion Lab make it possible for the center to function as one of NASA's strong right arms.





PHOTOMICROGRAPH of polished specimen is made by John Adkins. In inset at left, Adkins shoots precision parts in dust-free room.

BOB PACE operates "off the cuff" at Canaveral.

LIFTOFF of early JPL-developed corporal missile is covered at White Sands, N. M.

CIT's Jet Propulsion Lab

by GEORGE EMMERSON
Photo Services Head
Jet Propulsion Laboratory

One of the vital research centers backing up the man in space program is the Jet Propulsion Laboratory at the California Institute of Technology which operates as a facility of NASA. Although JPL's photo section is located at its main installation in Pasadena, cameramen are dispatched all over the state carrying out field assignments.

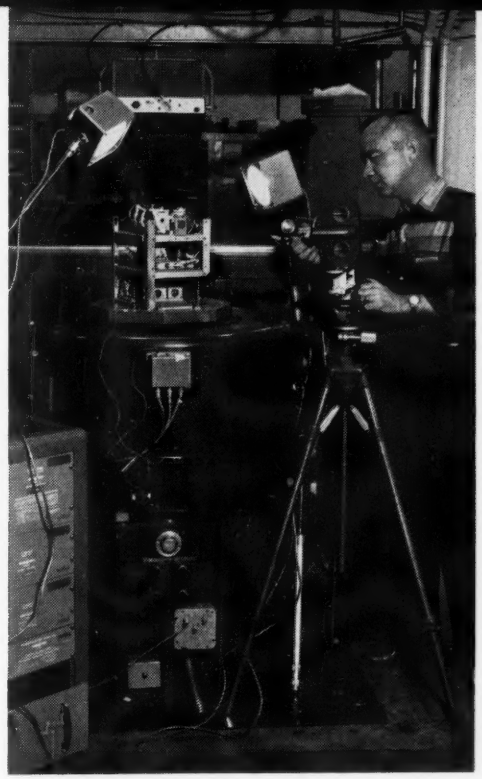
Founded in 1941, the JPL Photo Lab has grown to a staff of 40 who make up a day shift supplemented by a small swing shift. The Lab's eight photographers are trained to handle all types of assignments although several have their special slots.

Photo instrumentation is generally the responsibility of Don Maxeiner. Working closely with the Electronic Instrumentation Section and project engineers, Don has produced photographic answers to many perplexing problems. His cameras run the gamut from ancient, much-modified GSAP units to recent Fastax, Fairchild and Dynafax models plus a few built in JPL's own shops.

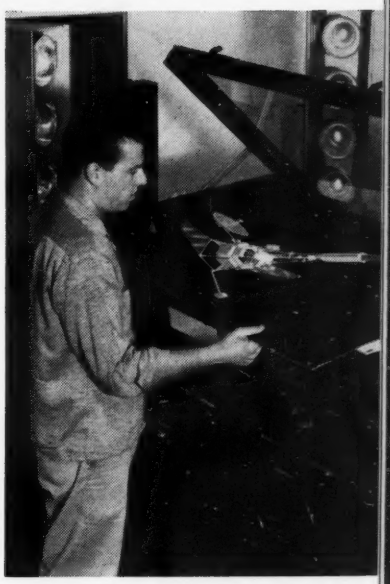
Photomicrography is the specialty of John Adkins. He services the Materials Section and gives macrophotographic support to the Clean Room assembly. The latter is where spacecraft components are carefully inspected and suspect units photographed in the continual search for the nearly invisible defect or trace of foreign matter that can mean either miles of significant data recordings or a pile of wreckage on a launch pad.

Two men concentrate on stills. Jim Rayle's documentation of Laboratory programs carries him into every corner of the home station. As the specialist in studio photography Hal Sobotker's jobs include everything from por-

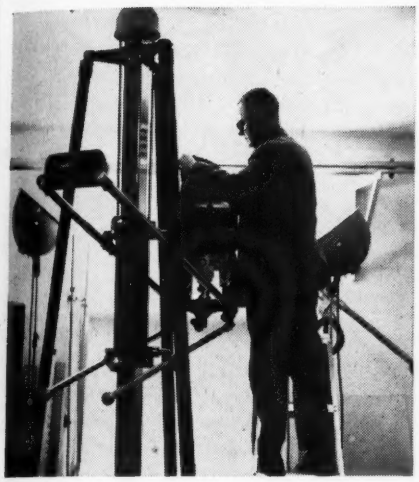
GEORGE WHITE documents JPL construction.



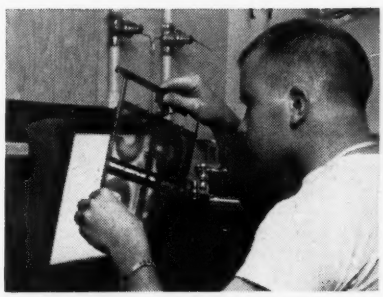
CHADWICK-HELMUTH unit is readied for vibration study.



ROBERTSON camera in operation.



STUDIO rig includes Calumet on Saltzman stand.



DICK BURROWS checks neg. development.

ED QUICK adjusts Elwood 8 x 10 enlarger.

traits to the illustration of a paper by a member of the engineering staff.

The rest of the photo team includes Bob Pace, Bill Rowe, George White and myself. As photographic "jack of all trades" our assignments vary from covering spacecraft launchings through sweating over a piece of oscillograph tape hunched under a blanket in the back of a car.

The photo lab is capable of filling any request for motion picture services up to a full 16mm sound production. Only processing is handled outside.

JPL's only permanent field test station at present is located on the property of Edwards Air Force Base. Here tests of a nature too hazardous for the area of the JPL headquarters are conducted. A one-man photo lab operated by Bill Tibbitts covers each test with high-speed movie cameras as well as processing negatives and oscillograph tape records.

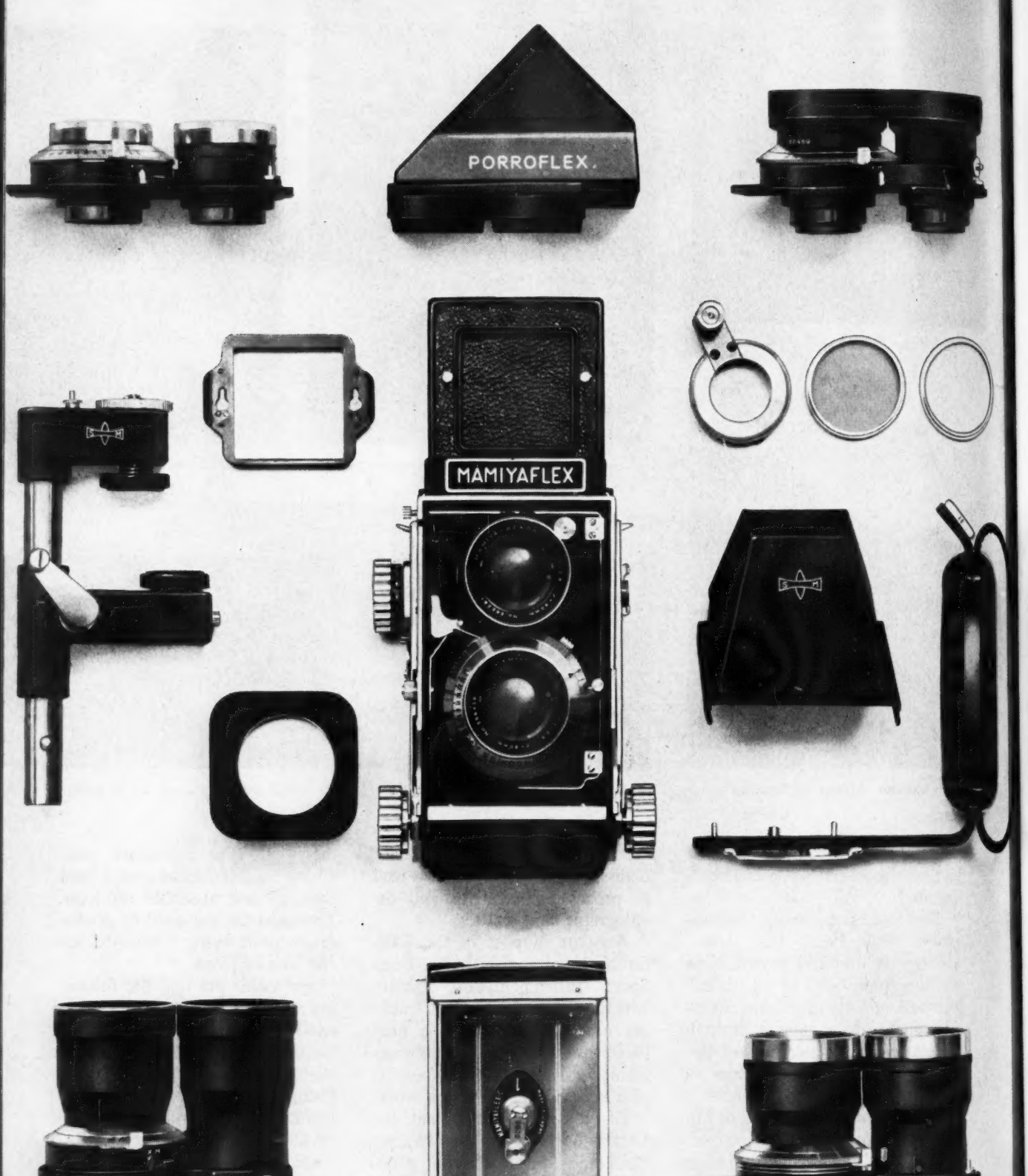
Another outpost in the California desert is the NASA Deep Space Instrumentation Facility which consists of two JPL tracking antennas. Again, one man performs tape and data film processing, still and movie shooting plus some instrumentation work.

Back at the main plant the Laboratory Services Section does black-and-white and color processing for various research sections where Schlieren tests, droplet dispersion studies of fuel injectors, flame propagation analysis, etc. are underway. The section also has helped equip these sections and standardize procedures.

Another service provided by the section is a camera pool where Polaroid Land and 35mm cameras are available on loan. The cameras are used to photograph units being fabricated for JPL out-of-plant.

For color printing the following equipment is used: Omega enlargers, an Eastman Kodak 8x10 contact printer, several Welsh Densichrons, a 16x20 Calumet print processor plus setups for negative and positive color film processing. With the introduction of Ektacolor materials 15 per cent of the lab's work is in color.

A 31-inch Robertson camera is kept busy during both shifts reproducing engineering drawings, data plots, printed circuits plus text as well as halftone copy for the multitude of reports and technical publications produced. □


PORROFLEX.
MAMIYAFLEX

MAMIYA C2

World's Most Versatile Twin-Lens Reflex

There isn't a picture situation which the Mamiya C2 can't handle with ease. Wide angle shots, tele shots, portraits, news, sports, travel—it takes but a moment to switch to the right lens for the job. And you have five interchangeable lenses to draw upon, ranging from 65mm wide angle to 180mm telephoto.

The versatility of the Mamiya C2 is unmatched by any other twin-lens reflex — its quality unsurpassed. The camera 'grows on you.' The ease and speed with which it handles become more and more evident — more gratifying every time you use it.

The Mamiya C2 with its complement of lenses and accessories is a complete system of photography—the most complete ever offered in a twin-lens reflex design.

MAMIYA C2 INTERCHANGEABLE LENS SETS

The Mamiya C2 is the only twin-lens reflex with lens interchangeability. Lenses may be interchanged quickly, easily—at any time—even in the middle of a roll of film. Each lens set consists of the 'taking' lens in M-X synchro shutter, speeds: 1 sec. to 1/500th, and an optically matched focusing-viewing lens.

a. 65mm f3.5 wide angle lens .....focuses to 4"
b. 80mm f2.8 normal lens .....focuses to 7"
c. 105mm f3.5 medium telephoto .....focuses to 16½"
d. 135mm f4.5 telephoto .....focuses to 24½"
e. 180mm f4.5 long focus lens .....focuses to 36"

MAMIYA C2 ACCESSORIES

Special aids that increase the versatility of the Mamiya C2, and fit it for every conceivable application.

f. PORROFLEX IMAGE-ERECTING EYELEVEL FINDER: A uniquely designed mirror finder that lets you focus and compose with the image right-side-up. Interchanges quickly with standard focusing hood.

g. STANDARD EYELEVEL MIRROR FINDER: Permits you to switch from waistlevel to eyelevel focusing and viewing. Interchanges with standard focusing hood. Image is upside down.

h. WIDE ANGLE OPTICAL SPORTSFINDER ADAPTER: Attaches to sportsfinder frame on focusing hood—gives field of view for new 65mm wide angle lens.

i. PARAMENDER PARALLAX CORRECTOR: Designed especially for close-up photography, the Paramender shifts camera so that 'taking' lens moves into 'viewing' lens position, thereby eliminating parallax.

j. RAPID-WIND FILM CRANK: A simple, convenient device that lets you advance the film faster. Provides greater speed for making rapid sequence pictures.

k. GRIP HANDLE: This hefty, handy camera grip with wrap-around hand-strap gives you a secure, comfortable 'feel' when doing hand-held shooting.

l. SINGLE EXPOSURE BACK AND FILM HOLDERS: For medical, scientific and other applications requiring special plate and sheet film emulsions. Accepts sizes 2¼" x 3¼", 2½" x 3½" and 6.5 x 9 cm.

OTHER ACCESSORIES INCLUDE: Optical Glass Filters, Lens Hoods, Eveready and Soft Camera Cases, Lens Set Cases and Compartment Cases.

Let your photo dealer show you how surprisingly little it costs to get started in Mamiya C2 photography, and how economically you can add lenses and accessories as you need them, ultimately ending up with the most exciting twin-lens reflex system ever designed. For complete details, write to Dept. IP-6.

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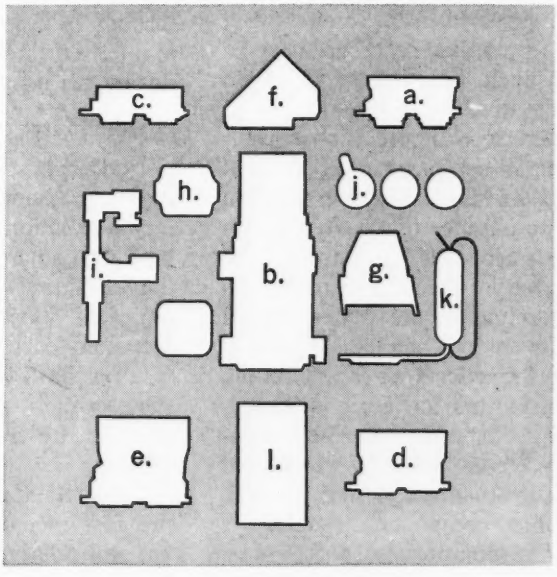

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EUROPEAN NEWSLETTER

continued from page 8

of a satellite camera system? First, it must have high sensitivity to the haze penetrating red end of the spectrum. It must store information for at least one circuit of the earth, as the satellite will only be within transmission range of its ground station for a few minutes during each orbit. It must be of minimum weight, operate unattended in a vacuum for a long period with great reliability, consume a minimum of power — yet despite all this, relay high resolution pictures!

Consider the problems of mechanical design. Ineffective heat dispersion due to operating in a vacuum is a common cause of equipment failure. Lacking air to carry away heat, electronic tubes and valves overheat, greatly reducing life. Thermal shields must thus be used, making contact between the glass envelope and structural members of the satellite to subtract heat by conduction.

Shielding Problems

Due to their greatly lowered boiling point at satellite altitudes, most liquids have a habit of boiling and seeping out of their containers. Explosive decompression can occur in components containing sealed-in air, and moving parts such as tape recorder bearings must be oil-free to avoid wholesale contamination.

Clearance in precision spring-mounted equipment must be precalculated for changes in position due to absence of gravity once in orbit. Similarly air bubbles will not rise in chemical batteries, so contaminating the plates. As if this were not enough there are also the effects of acceleration, vibration and meteoric bombardment. Complete reliability is usually accompanied by weight and size, so that the design of each satellite component requires a delicate compromise between reliability and payload restriction.

Last year's Tiros I (Television and Infra Red Observation Satellite) was a remarkable technical achievement, for 3 months regularly sending back thousands of usable meteorological pictures from a height of 450 miles. It utilized two special television cameras, one with an *f*/1.5 wide-angle lens embracing an 800-square-mile cloud cover, the other with an *f*/1.8 narrow-angle lens lined up to include just the center section of the wide-angle field. Each camera was designed for still photography and contained a 1½-millisecond focal plane shutter running in front of a ½-inch diameter pick-up tube.

Magnetic Recordings

Shutter operation allowed the lens image to fall momentarily on the face of this Vidicon tube, where it was briefly stored. Within the tube a narrow beam of electrons scanned the back of the screen in 500 'lines', cancelling out the 'stored' image and converting it into a stream of electrical impulses. Each camera fed its own magnetic tape recorder containing 400 ft. of tape running at 50 inches per second — enough to record signals from 32 'photographs'.

Tiros was interrogated on each of its 90-minute orbits during the 12-minute period it crossed from horizon-to-horizon above control stations in New Jersey and Hawaii. On command the recorders read out their crop of pictures through a television transmitter and erased the tape ready for use during the next orbit.

Power Source

The power for all this ingenuity came from internal 19-watt nickel-cadmium batteries charged by 9,000 solar cells arranged on the satellite's outer skin. Down on earth Video signals received recreated each original still picture on the face of a cathode ray tube, which was then photographed by a 35mm recording camera.

Understandably, pictures from the first meteorological satellites are still relatively primitive when definition is compared with contemporary aerial photography. The raster pattern, the limitations of vision signal recording on magnetic tape, and losses in transmission and reception all took their toll of final resolution.

In seeking improvement just what do meteorologists regard as a minimum standard of image resolution? Instead of lines per mm. it is more practical to consider just-discernible ground distances. Providing image brightness range is fairly high, resolution of one mile is acceptable for most applications. Broad measures of cloud cover over several hundred square miles may be made with resolution down to 2-3 miles, while distinguishing actual cloud types calls for something in the nature of ½-mile maximum.

Another technical headache is the met men's desire for cloud mapping over areas experiencing night-time conditions. This has been achieved by using I.R. detecting equipment to 'image' relative temperatures of earth, sea and sky. Unfortunately temperature measurement, even if accurate, is capable of misinterpretation. Polar clouds are generally warmer than the earth's surface, yet in tropical zones comparative temperatures are likely to be reversed. In other areas cloud-top temperature can be identical to ground temperature beneath.

Image Solution?

One promising method of improving resolution uses an electrostatic system. Here the basic optical image falls on a stationary 35mm electrostatic storage tape instead of the pick-up tube. Light causes differences in potential across the surface of this flexible tape, in a similar manner to a xerographic plate. With the electrostatic image formed within the tape it may be moved by one frame — roll film style — to store the next optical image.

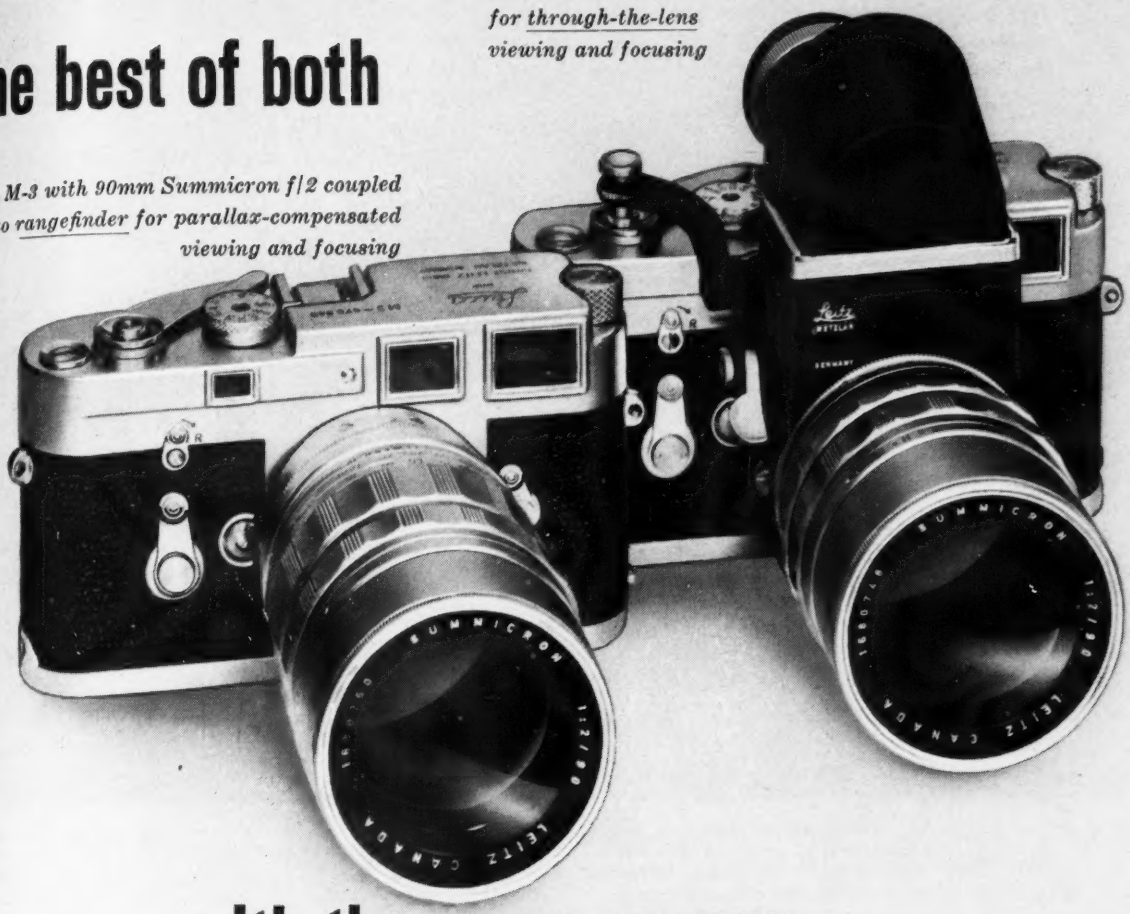
For read-out the tape is positioned before a gun yielding a finely focused beam of electrons which scan the image. Like a hose-pipe cleaning a white-washed wall this converts the tape's varied potential into earth-beamed signals, leaving it erased for re-use. By this method more

continued on page 97

the best of both

Leica M-3 with 90mm Summicron f/2 and Visoflex II for through-the-lens viewing and focusing

Leica M-3 with 90mm Summicron f/2 coupled to rangefinder for parallax-compensated viewing and focusing



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The VISOFLEX II is an accessory that enables you to change the rangefinder Leica into a compactly efficient single-lens reflex camera whenever you wish. This marvel of 35mm versatility and enjoyment is a pivotal member of the Leica System, the world's most complete system of photography.

Choice between rangefinder and through-the-lens photography is not just a matter of taste. Each has definite advantages; that's why both have always been provided for in the Leica System.

When short and normal lenses are being used at normal distances, rangefinder viewing and focusing is easier and very much more accurate. Through-the-lens viewing and focusing offers advantages when long lenses are being used or in extreme close-up photography.

When you own a Leica, you may choose from rangefinder-coupled lenses 21mm to 135mm in length. *With the same Leica* and a VISOFLEX II, you may use lenses from 65mm to 400mm in length. A number of the lenses can be used with both systems. Designed for fast hand-held shooting and eye-level comfort, the VISOFLEX II delivers an upright, unreversed image on a ground-glass screen so fine-grained and clear you forget it's there. You also forget the VISOFLEX II is there, it's so compact and so much a part of the Leica. The smooth precision operation is typical of any Leica-accessory combination.

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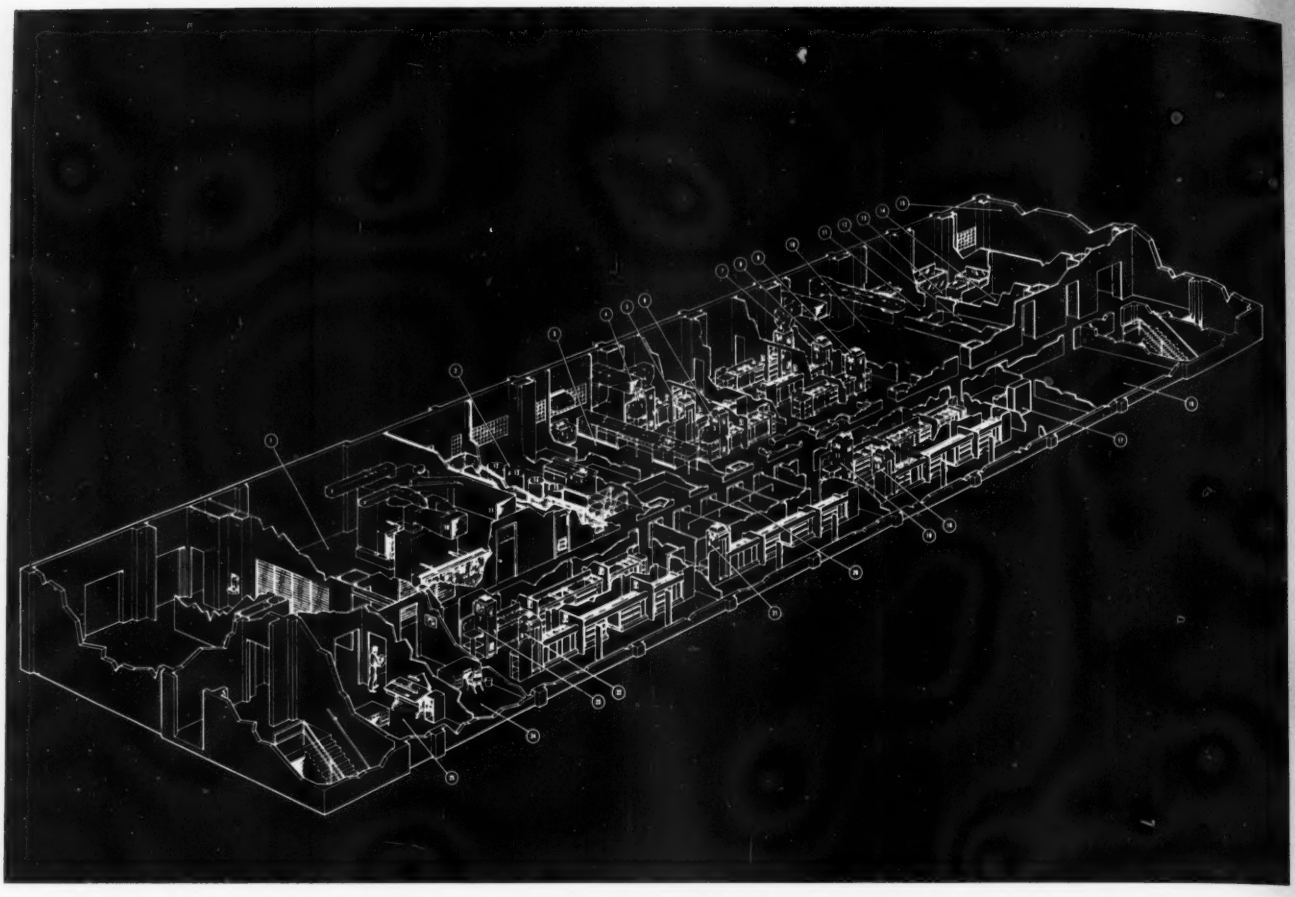


FIRST FLOOR of lab, Patrick Air Force Base: 1) Micron air filters and air handling units. 2) Chemical mix room. 3) Chemical analysis room. 4 & 5) 16-35 mm b&w hi-contrast negative machines. 6) 16-35 mm b&w low contrast negative machines. 7 & 8) 35-70 mm b&w hi-contrast negative machines. 9) 16-35 mm b&w positive machine. 10) Wide film room. 11 & 13) Wide film dark rooms. 12, 14, 24, & 25) Offices. 15) Chemical storage room. 16) Locker room. 17) Chemical control machine. 22) 16-35 mm color rev. machine. 23) 35-70 mm color rev. machine.

Tomorrow's Films Today

Cape Canaveral, America's kickoff point to the future, is serviced by a super lab.

"The finest." That description can be applied to almost everything and everyone connected with Cape Canaveral's missile effort. It certainly can be applied to the Air Force Missile Test Center's movie lab.

Located in the Technical Laboratory Building at Patrick Air Force Base, the $1.4-million lab provides fast but quality processing of all flight test motion picture film. It operated at peak performance in handling the footage of Astronaut Shepard's historic flight (see page 24).

Operated for the Center by the Radio Corporation of America, the lab has 11 machines capable of processing a half-million feet of black-and-white and color film daily. This speed is necessary because more 70mm, 35mm and 16mm motion picture film is exposed during a single missile launching (which takes only minutes) than all the 35mm film that is consumed in photographing an average Hollywood feature production during a four-month shooting schedule.

Quality Control

Water used to wash the film passes through special filtering machines, which take out all impurities larger than five microns. (a pencil dot is about 50 microns across.)

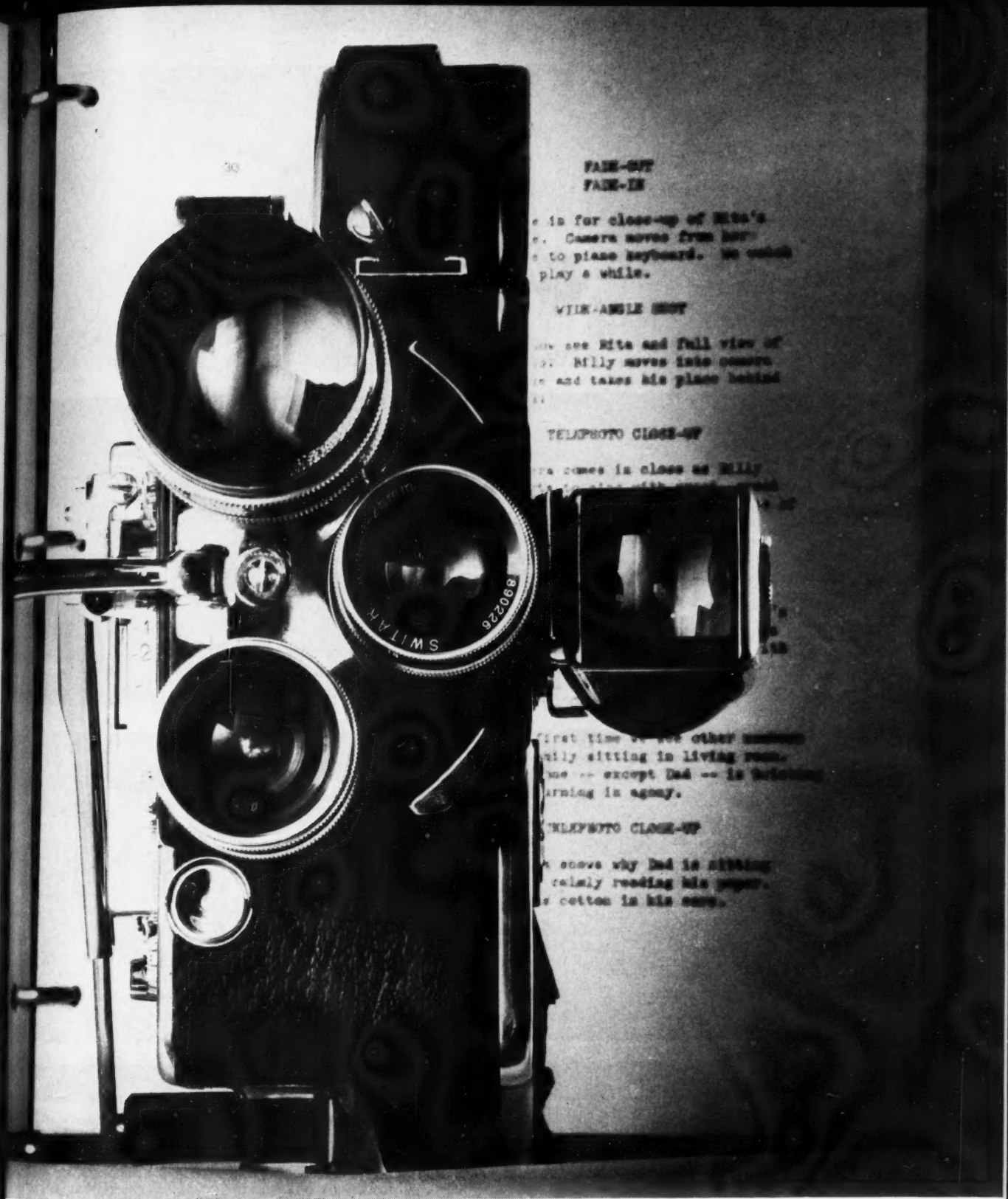
The lab's air is as thoroughly cleaned as is its water. From it, too, all impurities larger than five microns are removed by a high-powered air-conditioning system.

Five miles of chemical piping, 800 valves and 150 pumps are needed to move the more than 10,000 gallons of developing solutions to and from processing machines. Each pipe is color-coded and has directional arrows showing flow, source and discharge point. Cooling machinery so powerful it could make 40 tons of ice a day maintains the constant 70-degree temperature needed to process the motion picture film.

The lab was designed to permit changeover to new processing systems as they are developed and needed. Duplication of developing solutions has been avoided by using common solutions for several processing machines.

Silver is recovered from black-and-white processing by using

continued on page 62



To get everything in the script, you have to get a Bolex

Hollywood effects and award-winning quality are no longer the personal possessions of "the professional"...

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Then there's Bolex's new variable shutter. It gives you more control over exposure, sharpens fast-action subjects, and blurs distracting backgrounds. It puts fades at your fingertips, makes lap dissolves smooth and easy. (For automatic fades and perfect lap dissolves, try a Bolex Rexofader. It times fades for pre-set number of frames.)

With all its professional features, Bolex's H-16 Rex is only $450 with a superb Lytar F/1.8 lens. Bolex accessories are also moderately priced—the Rexofader, for example, is just $37.50. For detailed literature write Dept. or see your Bolex dealer for complete information.

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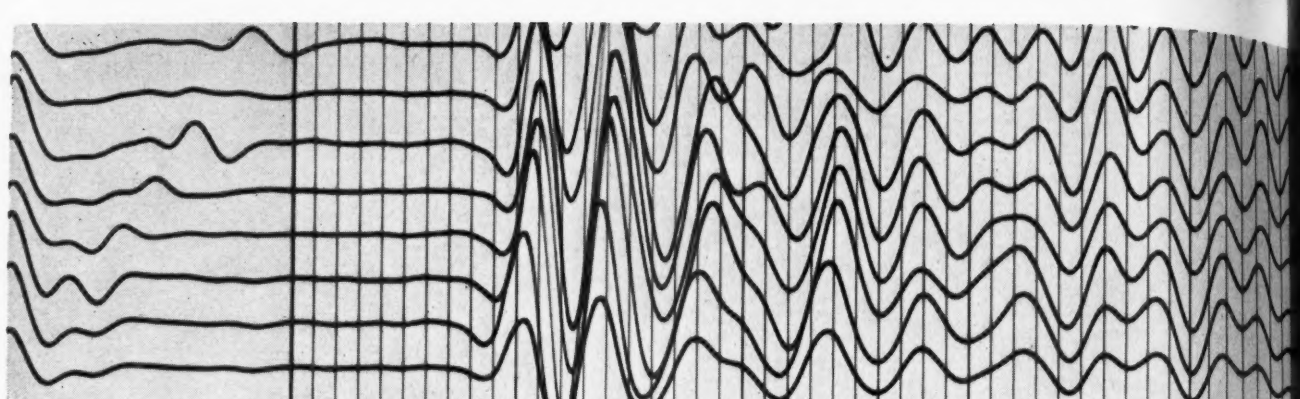

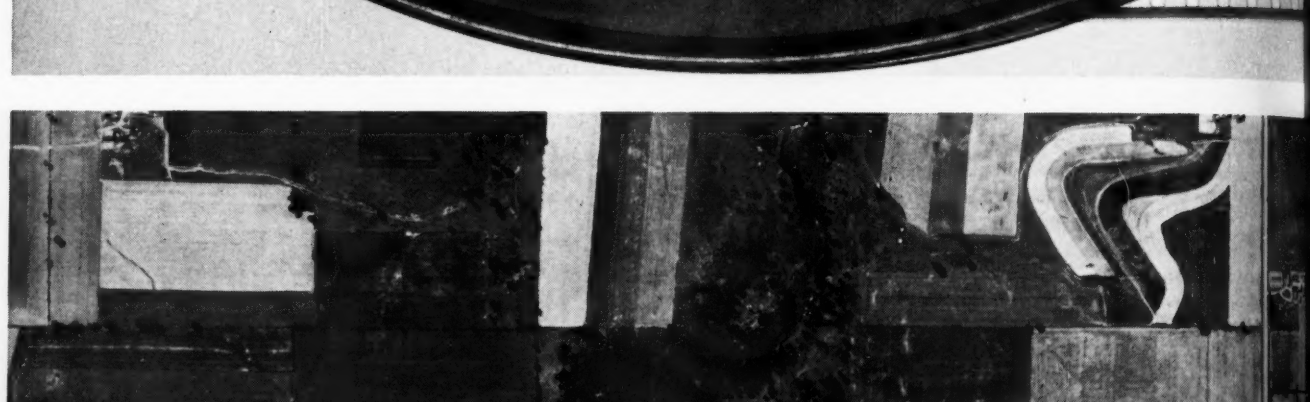

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Du Pont photo products have created a unique place for themselves in the complex field of industrial photography.

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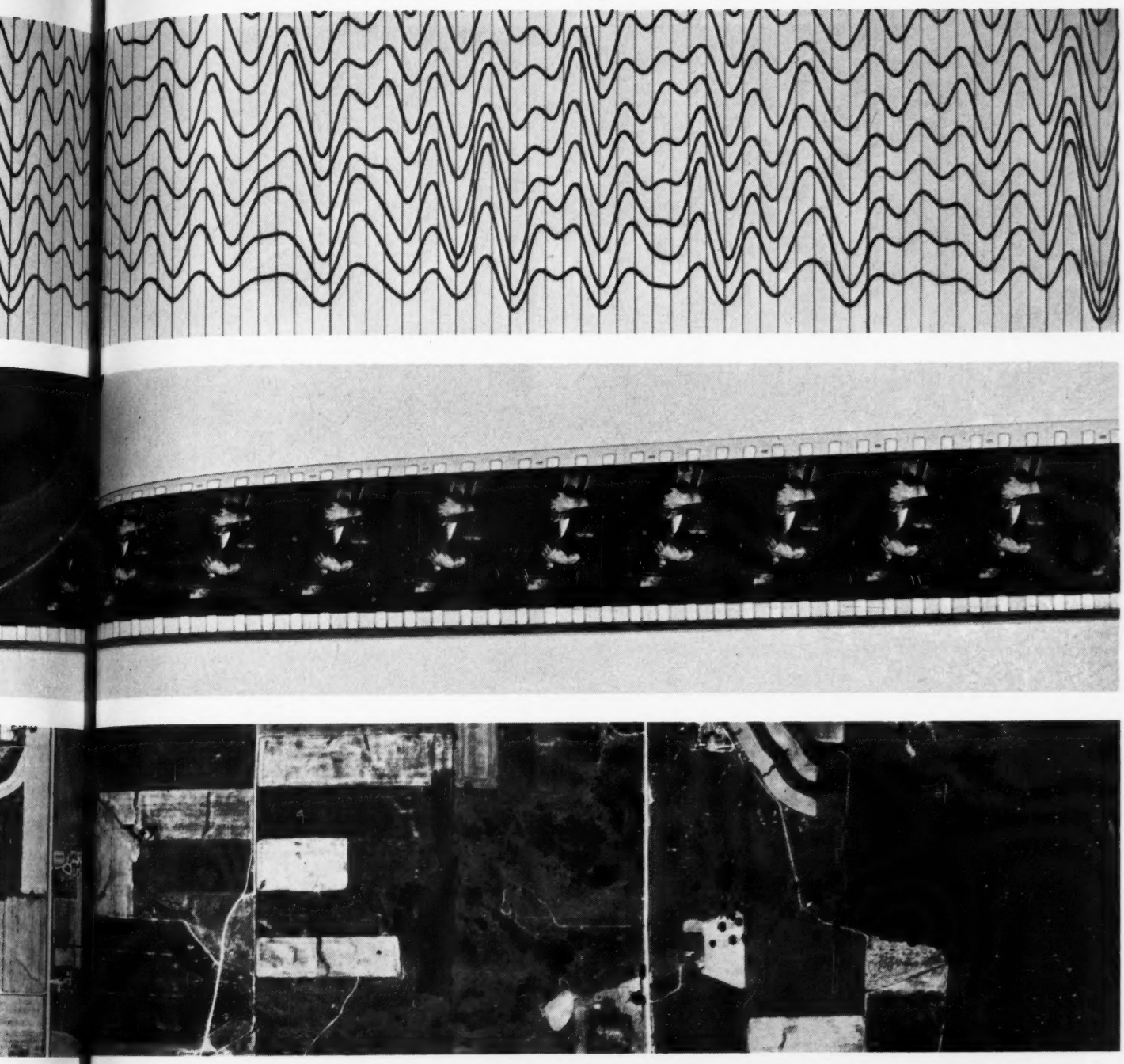

definition for all in-flight applications.

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Lino-Flex Photorecording Film
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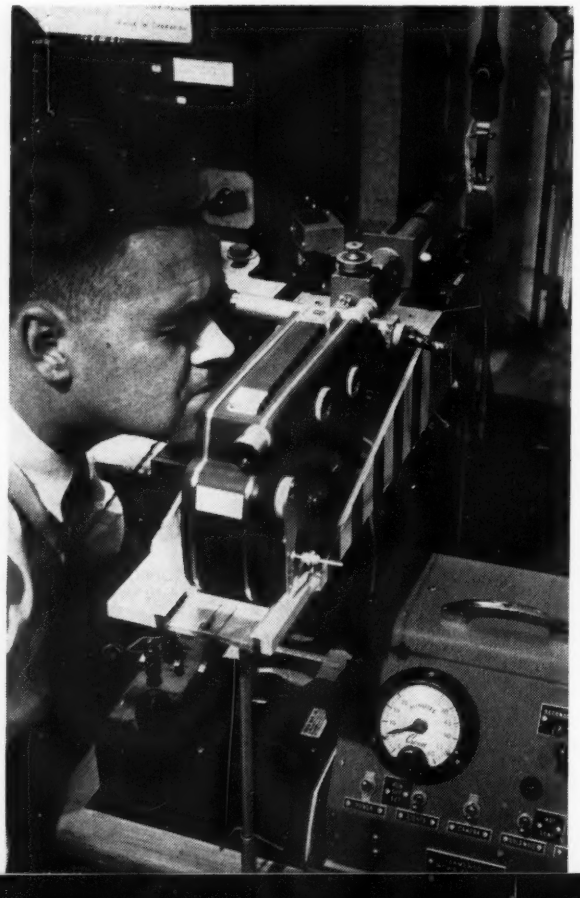
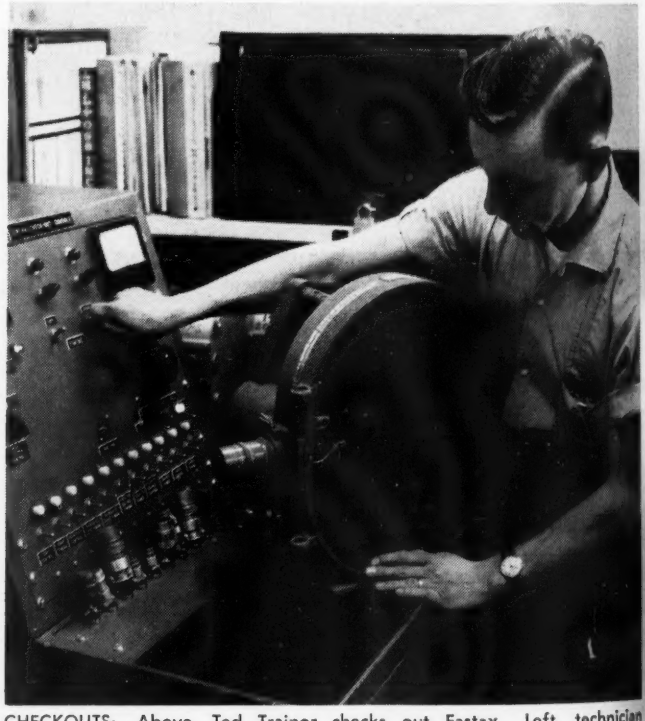
Circle No. 537 on Post Card

PLASMA ENGINE flashes brightly during test. Camera at left is aimed at a small copper cup which swings back along a scale when the thrust of the engine hits it. The short circuit in the cable at lower right wasn't discovered until The Martin Company photographer took this picture with natural light.

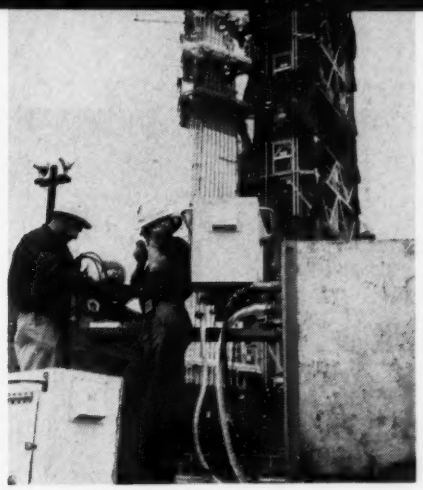




CHECKOUTS: Above, Ted Trainor checks out Fastax. Left, technician checks the view on a solenoid-controlled movie camera before a creep-strain test. The camera, which will magnify the subject, is aimed at a small metal specimen on a gauge. It is controlled by the instrument at its right, which can be set to take individual frames at pre-determined times during the test.

Enough to Shoot a Hollywood Epic

That's how much film is exposed every time Martin's Denver plant captive-fires a Titan ballistics missile.



CAMERAMEN Jim Yablonski (left) and Fred P. Walden (right) ready their respective Fastax and Milliken before Titan test stand.

Each time a TITAN ICBM is captive-fired on a ridge of the Rocky Mountains at The Martin Company's Denver Division, 20 motion picture cameras expose enough 16mm color film to shoot a major Hollywood epic.

An average of 8,800 feet of film shoots through the film gates of the cameras in about three minutes. It's an expensive operation (cameras used in a single firing represent an investment of about $70,000) but absolutely essential to the development and testing of booster rocket systems. Martin has much of the responsibility for carrying out this phase of the nation's man-in-space effort.

The company pioneered in missile photography with launchings of the Viking rocket in the late 1940's and early 1950's. At this time the photo section began to develop new systems and techniques for shooting all launchings and flights.

Today the company has divisions in Baltimore, Denver and Orlando and Cocoa, Florida. At each division there is a fully equipped photo section. The part a Martin photographer plays in a project, whether it be to study the methods for landing on the moon or for launching a missile half way around the world, are many.

Firings

The photographer is rarely the man behind the lens when he is at a missile launching. Instead, he is the man behind the button or switch or just an observer. It takes five technicians two hours to set up the camera equipment for a captive firing, with two men operating the cameras from a console in a nearby blockhouse when countdown begins.

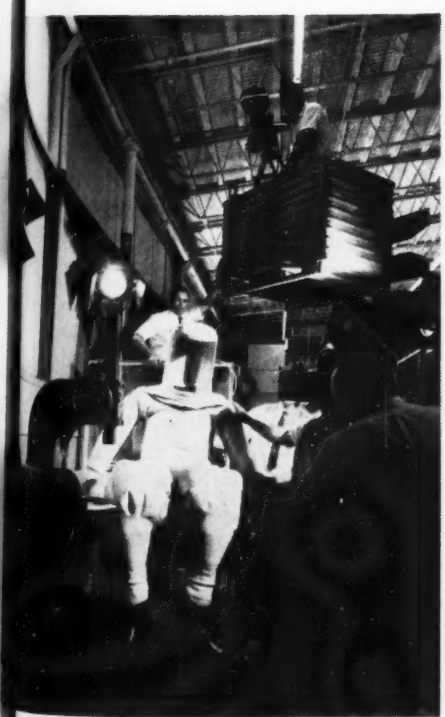
The following battery of cameras might be used on such a project: six Auricons, seven Millikens, one Wollensak Fastax, one Fairchild, three B & H N-9s and two Maurers. Some cameras track the missile by use of radar, utilizing a superimposed grid to denote whether the missile is on or off its expected path. Footage is taken from every useful angle and at every speed possible — long shots, close-in shots, normal speed and even sequence shots right up into the engine during firing.

Sometimes the cameras are loaded with infrared film for heat studies. Normally, however, they run Kodachrome, Super Anscochrome, Ektachrome and High Speed Ektachrome balanced to 3200K. When supplemental light is needed GE Par 64 lights are set up, running off a ColorTran power unit.

Because of the importance of the film in analyzing firings commercial labs turn it out on an overnight basis. At the Denver branch it's flown to Cinechrome, Arizona Color or Western Cine Service.

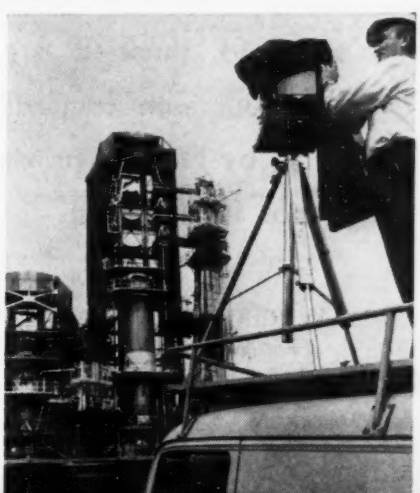
Often the cause of a launch failure can be found only with the aid of the camera. When connections between the missile and its servicing or umbilical tower were swinging back and banging against the vehicle during launch, the condition was

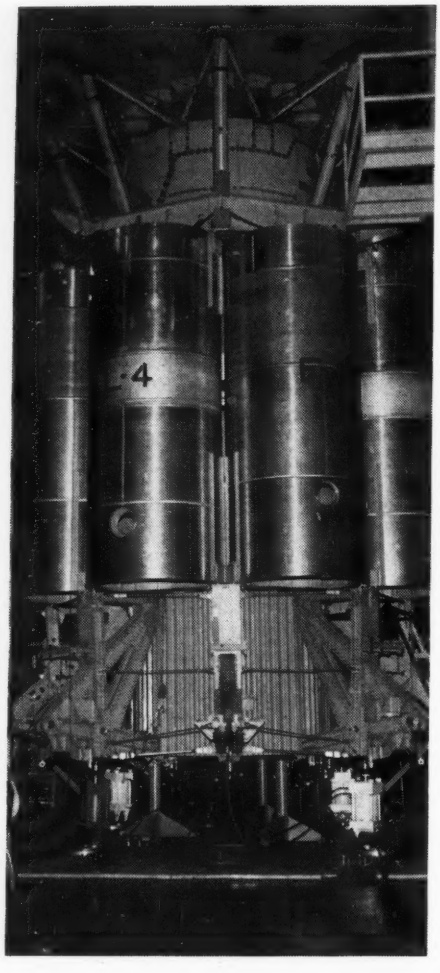
continued on page 84

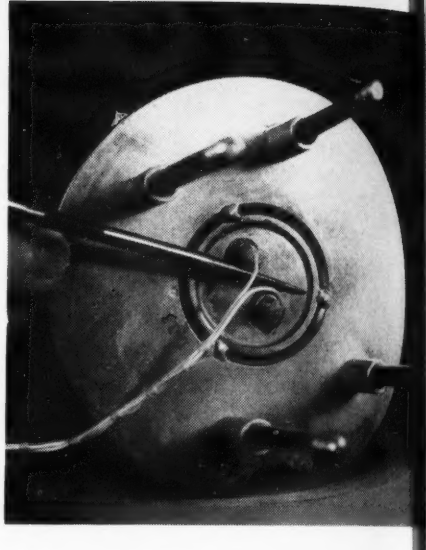


TEST of pressurized space suit is recorded by motion picture crew.

STILL PHOTOGRAPHER Ed Welter shoots Titan test stand from platform of film services camera truck.







LEFT: Photographic coverage is required for a wide variety of tests at the Marshall Center, including this structural stress test on a "short" Saturn booster conducted in the Center's Structures and Mechanics Division. ABOVE: Camera records a spin test on a satellite payload, which simulates the appearance of the satellite during flight in space. RIGHT: Camera was employed to record a minute crack in a weld in this close-up view of a rocket component.

Test Recording at Marshall

Things and theories are checked out with cameras and film by NASA's prime space flight center.

by ERNEST HARDIN
Photographic Branch
Marshall Space Flight Center

One hundred years after Matthew Brady set out to photograph the Civil War with a wagonload of cumbersome equipment a new generation of photographers armed with an entirely new breed of cameras is helping man to explore outer space.

The Photo Branch at George C. Marshall Space Flight Center, National Aeronautics and Space Administration, Huntsville, Ala., exemplifies this new concept in photography by its direct support of the many and varied scientific operations at the Center.

The Marshall Center is a new NASA organization built around the pioneering Wernher von Braun rocket team which was formerly a part of the U.S. Army. The MSFC is responsible for developing and launching NASA's space vehicles, the major current project being the giant Saturn rocket.

Since its inception last July, the value of Marshall's Photo Branch has been recognized by the increasing demand upon it for photographic coverage of the Center's activities.

In the course of a day's time it is not unusual for camera crews to cover assignments of a dozen different types. These range from a simple portrait made with a studio view camera to ultra-high-speed motion pictures of an electric spark arcing between two electrodes, using an 8mm Fastax at 16,000 frames per second.

Both stills and motion pictures are used at Marshall for several prime purposes. These include instrumentation evaluation, test recording, component documentation and assembly of components, systems tests, environmental testing and public information. Each of these functions generates requirements which differ from the others.

In the area of instrumentation evaluation, photography is utilized to record finite values of reactions which cannot be ade-

continued on page 48

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The superb lenses illustrated below might never have been produced . . . had there not been a **Linhof** to inspire a **Zeiss!** It was indeed at the behest of the world-famous Linhof Camera Works that West Germany's Carl Zeiss designed these truly extraordinary lenses. In the rigid conditions set forth by Linhof, cost of development was no factor. The lenses had to be the finest obtainable . . . their basic characteristics were to be **unsurpassed image quality, ample speed for poor light, and excellent definition at all apertures.** Result . . . the incomparable Linhof series of Carl Zeiss lenses!

Though created specifically for Linhof Super Technika cameras, these superb optics enhance the capabilities of other makes of 4x5 and 2¼x3¼ cameras as well. No matter what your choice of camera or your field of endeavor—advertising, technical illustration, portraiture, architecture, pictorials, news, or fashion—try one of these Zeiss lenses on your next assignment. Your investment will reward you for a lifetime! **Available only through your franchised Linhof dealer.**

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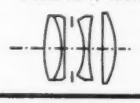
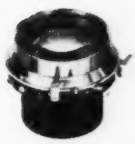
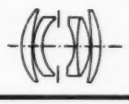
TESSAR
f/3.5 105mm (for 2¼x3¼)
f/4.5 150mm (for 4x5)
Synchro-Compur shutter,
1 sec. to 1/400th



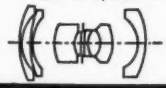


PLANAR
f/2.8 100mm (for 2¼x3¼)
Synchro-Compur shutter,
1 sec. to 1/400th

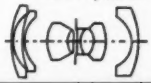


PLANAR
f/3.5 135mm (for 4x5)
Synchro-Compur shutter,
1 sec. to 1/400th

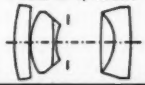
BIOGON
f/4.5 53mm (for 2¼x3¼)
Synchro-Compur shutter,
1 sec. to 1/500th



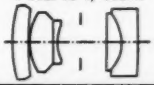
BIOGON
f/4.5 75mm (for 4x5)
Synchro-Compur shutter,
1 sec. to 1/500th



SONNAR
f/4.8 180mm (for 2¼x3¼)
Synchro-Compur shutter,
1 sec. to 1/400th



SONNAR
f/5.6 250mm (for 4x5)
Synchro-Compur shutter,
1 sec. to 1/400th



Objective	Largest Aperture	Focal Length mm	Useful Diameter of Circle in mm	Maximum displacement of the objective for horizontal format* Vertical ± mm	Horizontal ± mm
2¼x3¼ in.					
PLANAR	f/2.8	100	120	12	9
TESSAR	f/3.5	105	120	12	9
SONNAR	f/4.8	180	140	26	20
BIOGON	f/4.5	53	115	9	6
4x5 in.					
PLANAR	f/3.5	135	170	13	10
TESSAR	f/4.5	150	165	9	7
SONNAR	f/5.6	250	185	22	19
BIOGON	f/4.5	75	165	9	7

*For vertical format, interchange the values.

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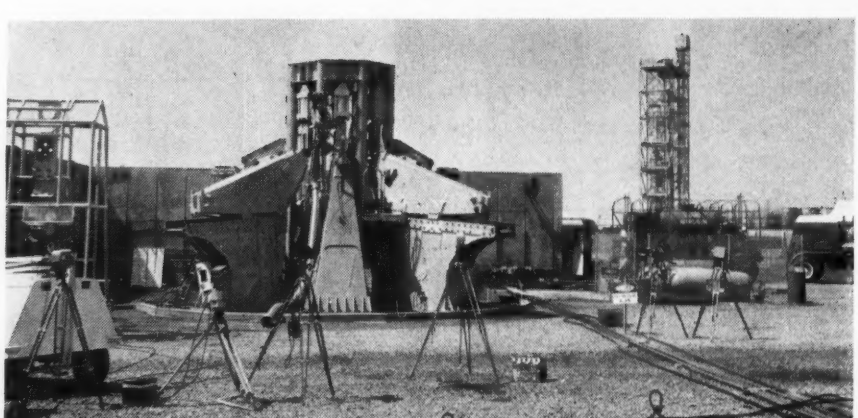


THE NUMEROUS CAMERAS used to photograph a malfunction test at the Saturn hold down assembly site at the Marshall Center are seen in the foreground just before a test.

continued from page 46

quately measured and recorded by other systems of instrumentation. Typical examples would include the amount of flame dispersion on jet deflectors, the amount of corrosion on material samples, amount and pattern of movement of liquids under study, and so on.

Test recording photography lends itself almost exclusively to operations by test engineers as a recorded backup of the overall or specific observation of the test specimen and the test facility. Coverage of this type is invaluable in the event of malfunction or abnormal behavior in any portion of a test.

A good example of this type of photographic coverage is seen in the recent static firing tests of the Saturn booster, in which the complete cluster of eight engines was fired simultaneously. Between twenty-five and thirty Fastax, Milliken and Mitchell high-speed cameras were mounted at strategic positions around the booster of the 177-foot vertical test stand. In the event of any malfunction during the firing test the test engineers would have probably been able, by evaluation of the film, to determine the exact location and cause of the malfunction.

Other cameras, including an Auricon sound camera, and several Speed Graphics and Super Graphics, were mounted on a nearby blockhouse to give overall coverage of the test tower from medium range. These were triggered remotely from the blockhouse, as were the cameras on the test stand.

Still another battery, comprised of Arriflexes and Cine Specials with their crews, was located atop another building farther away, picking up long range shots.

Not Limited to Tests

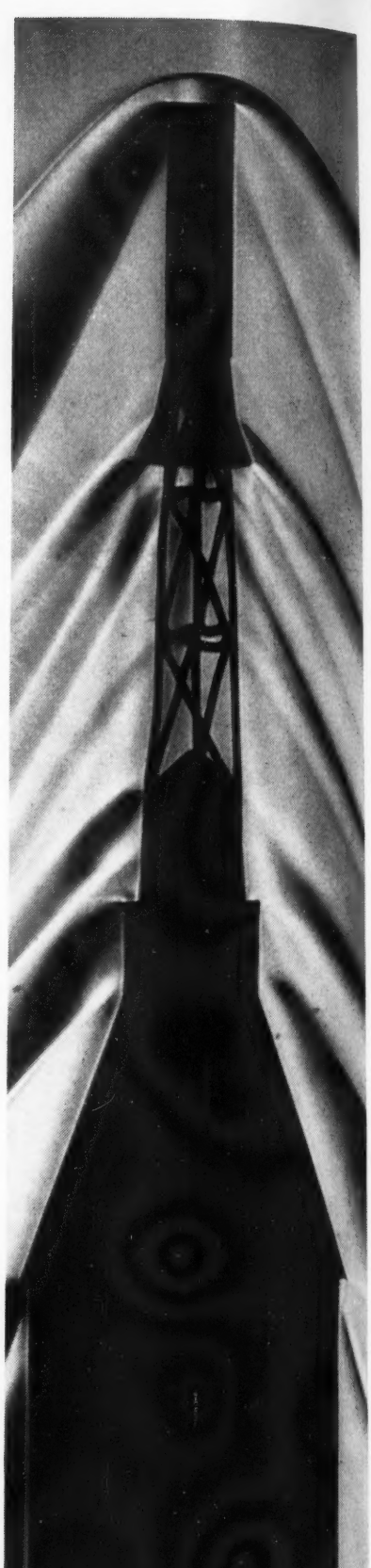
The results of this coverage were not limited to test evaluation alone, for film clips and stills, both in black-and-white and color, were immediately released to public information media, including professional publications and general press and television outlets.

Still photographs play a very important role in the technical reports issued by the different divisions at Marshall. These photos are usually an integral part of a report, illustrating such things as specimens to be tested, method of test, results of the test, etc.

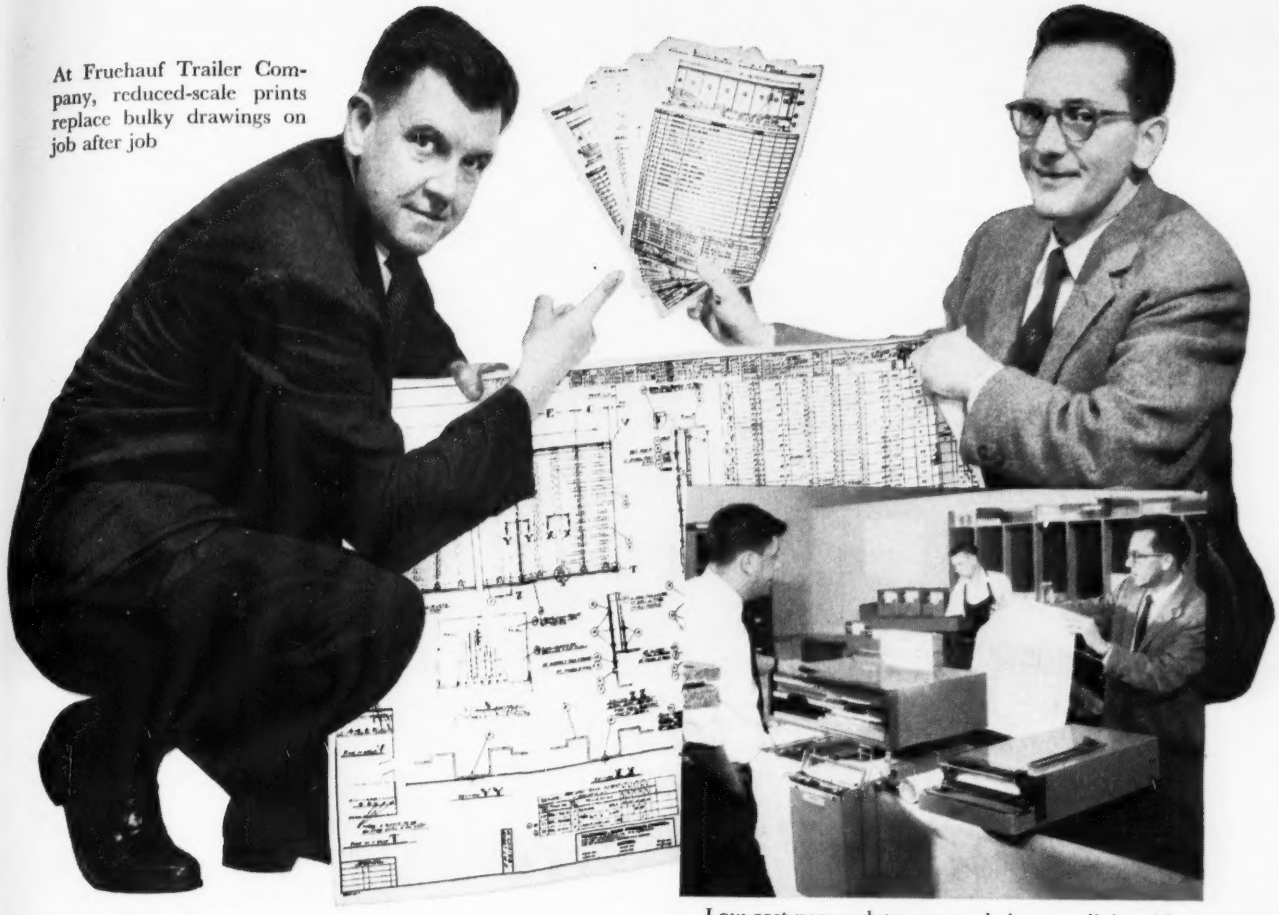
A commonplace occurrence among still cameramen is to find themselves confronted with problems which tax the ingenuity of even the most experienced. For instance, to photograph clearly the most minute scratches on a cylindrical, highly-polished steel surface. Here correct lighting plays a most important part, as well as the use of swings and tilts for perspective and depth of field.

A recent experience of one of the still men points up the resourcefulness that must be displayed in coping with unusual situations. The object to be photographed was a series of tiny corroded pits on the surface of a

continued on page 91



SCHLIEREN photo of a Mercury-Redstone rocket model undergoing test at Mach 2 in the wind tunnel at the Marshall Center.



At Fruehauf Trailer Company, reduced-scale prints replace bulky drawings on job after job

Low-cost paper plates are made in room light with table-top Kodak Ektalith installation

Reduced-scale drawing program that's budget priced!

Fruehauf Trailer Company (Detroit Mich.) teams up Kodak Ektalith units (costing less than $800) with copy camera and offset duplicator to get reduced-size offset prints which speed production, reduce errors, cut print-making costs.

Each of Fruehauf's trailer models can be ordered with modifications to suit customer needs—a side door here, special cargo holding rings there, and so on. Details on these modifications must be sent to the shops and assembly lines "on the double."

Formerly, this was done by making large whiteprints which combined the original engineering drawings, the modifications, and the bills of material. These prints were often hard to interpret . . . paved the way for production delays.

Now with the Kodak Ektalith Method, Fruehauf combines the drawing of each part modification and its respective bill of material on one form. Then makes a reduced-scale offset paper plate in 3 fast steps—

1. **Exposure** at reduction of 50-60%—in office camera.
2. **Processing** in Kodak Ektalith Loader-Processor.
3. **Transfer** to low-cost paper plate with attached Ektalith Transfer Unit. Job's ready for duplicator in *less than 2 minutes.*

Fruehauf likes the way the Ektalith Method faithfully reproduces fine linework and solid areas . . . and the savings which result from using reduced-scale prints on a wide variety of jobs. For example: Ektalith-made plates produce (1) Vellum copies for use as print-making masters; (2) Sales manuals and standard parts catalogs, which include halftone illustrations; (3) Production engineering schedules of date on "photo panels." *Plus many other jobs.*

All in all, Fruehauf feels that its Kodak Ektalith installation has already more than paid for itself!

If you, too, are looking for ways to improve business communications it will pay you to investigate the Kodak Ektalith Method. *Free booklet gives details.* Call local Kodak Ektalith Dealer or write Eastman Kodak Company, Photo Reproduction Products Div., Rochester 4, N.Y.

KODAK **Ektalith** METHOD ***...puts you ahead in offset duplicating***

Kodak TRADE MARK

CONFERENCE. Out of sessions like this one came a unique technically-animated film predicting the behavior of the capsule that carried Astronaut Shepard into space. McDonnell Aircraft was so gratified, it is planning others.

McDonnell's Astro-Animation

Knowing the anticipated behavior in space of the capsule that carried astronaut Shepard was an essential element in getting Project Mercury off the ground. The neat trick of graphically demonstrating this behavior *before the flight* was solved by McDonnell Aircraft Corp., manufacturer of the capsule, with a unique in-plant animated film.

Because of security problems it was a film that had to be made in-plant. However, the result of McDonnell's first 100 per cent technically-animated film was so gratifying that others are in the offing. These results included a number of production time and cost shortcuts that were devised during filming.

Produced by McDonnell's six-man motion picture section (part of a 35-man photo department), the film is a 13-minute effort. Normally such a film would require multi-thousands of animation cells to show the complex operation of the capsule from blastoff to reentry and landing. By experimenting, McDonnell's moviemen were able to eliminate thousands of cells that would have been needed to shoot cell-by-cell animation.

A 16mm Mitchell camera was used on a TEL-Anima animation stand. The camera, equipped with a McDonnell-built stop-motion motor to allow single frame exposure, had zoom in-and-out capabilities while the animation table allowed north, south, east and west movement. In addition, a special ring constructed by McDonnell people allowed art work to be moved independently of the animation table.

ANIMATED OR LIVE, films require editing.

In order to show minute details of the capsule, art work was drawn oversized, then reduced by shooting it on Kodak Ektacolor Film and printing it on Kodak Ektacolor Paper. This was cut out and glued to acetate animation cells. Thus the same art work, reduced to different sizes, was used in a variety of ways in several scenes.

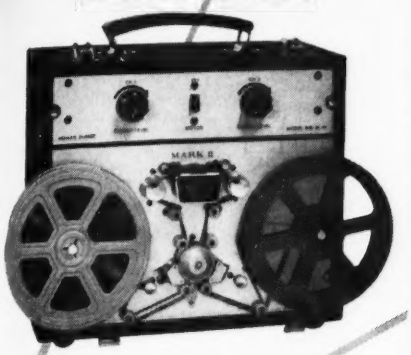
Four types of animation were employed in filming the picture: cycle, wipe-off, cell-by-cell and gadget.

1. ***Cycle animation*** *was used in the scenes showing flames sprouting from rockets. Varying flame cells were alternated to give the impression of spurting flames.*
2. ***Wipe-off animation*** *was employed in showing the orbit of the capsule around the earth. In this procedure a complete orbital path was drawn on the artwork with a chalky substance. Then as each frame was exposed, a predetermined amount of the line was wiped-off. After the entire scene had been shot*

continued on page 75

SOUNDS of Advancement from PICTRONICS

The New Magnasync Mark II DUBBER



In Its Own Portable
6½" x 8½" x 10" Case

The "little giant"! That's what you'll call this new precision dubber when you check all the professional features Magnasync has built into such a small unit—

- SMPTE standard performance
- Completely transistorized
- Exceptionally light in weight
- Extremely easy to operate
- Low power consumption
- Smartly housed in durable carrying case (standard rack mount also available)
- Flutter & Wow—.25% or less
- Distortion--2% or less
- Frequency Response—50 to 8000 ± 2 db
- Signal to Noise—50 db or better
- Film Capacity—400 ft. split 16mm

For Complete Information and Specifications...Write, Call or Visit

PICTRONICS CORPORATION
Audio Visual Engineering & Equipment Center
236 East 46th St., New York 17, N.Y.
YU 6-3713

NOW, LIP SYNC SOUND WITH ANY BOLEX CAMERA

A new development by Magnasync is being hailed as a boon to industrial and in-plant movie makers, freelance TV cameramen and others who find themselves with a low budget with which to produce a sound film. Called the Magnasync Nomad Mark I, it is a completely transistorized, truly portable magnetic sound recorder — (weighs only 7 lbs.). Split 16mm magnetic film, rather than tape, is used and provision is made for recording separate sound tracks for voice and for music. The two tracks are automatically mixed when played back thus eliminating the need for sound dubbing as well as for making a duplicate of the original film to get a composite print to combine picture and multiple sound tracks.

The new Magnasync Nomad Mark I not only makes the Bolex a sound camera, it will make any 16mm camera a sound camera and any projector a sound projector. In filming or projecting, positive interlock is achieved by a flexible cable. This cable is lead from the camera plugged into the proper jack of the recorder. The spring motor that turns the camera thus drives the recorder. For projecting, a flexible cable, with its own gear box, is attached to the framing knob of the projector and to the Nomad.

The light-weight Magnasync Nomad Mark I is mounted directly under the Bolex with a special bracket. Provided with the unit is a set of earphones for monitoring and a remote hand mixer that contains VU meter, record and playback controls, film-direct monitor switch, battery test switch, microphone input and earphone output jacks.

To assist Bolex owners to fit their cameras with the new Magnasync Nomad Mark I, and to instruct them in its use, a special department has been set up by Pictronics, Inc., 236 E. 46th Street, New York City.

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The New Magnasync Mark II RECORDER REPRODUCER

In Its Own Portable
6½" x 8½" x 10" Case

Only Magnasync could engineer a professional precision constructed split 16 sprocketed reproducer to offer you so much more in so much less space—

- SMPTE standard performance
- Completely transistorized—lightweight as well as compact
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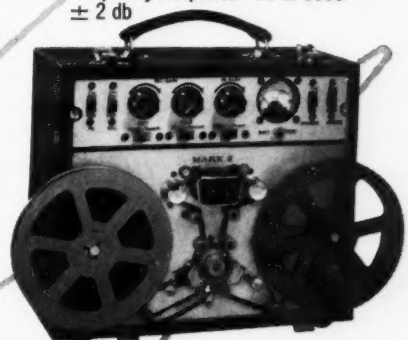
- Extreme ease of operation
- Rechargeable nickel cadmium battery—built in battery charger
- Low power consumption
- Projector interlocks available
- Smartly housed in durable carrying case (standard rack mount also available)
- Wow & Flutter—.25% or less
- Distortion—2% or less
- Frequency Response—50 to 8000 ± 2 db



- Signal to Noise—50 db or better
- Film Capacity—400 ft. split 16mm

SOUNDS of Advancement from PICTRONICS

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Audio Visual Engineering & Equipment Center
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ENGINEERS find Filmac 200 reader/printer useful for fast scanning of microfilm

PRINTMASTER duplicates originals at Marshall.

TOP, TD

Rapid Repro fo

by JILL ENGLISH, *Associate Editor*

Helping carry out the objectives of the rocket-building program at the Marshall Space Flight Center in Huntsville, Ala., is a devoted group of men and women quartered close by in the Technical Documentation Section (TDS) of the Army Ballistic Missile Agency. TDS is responsible for receiving, checking, recording, storing, reproducing and distributing documents and relay data for each component of every missile system.

From 1950 to 1954 blueprints and original drawings were manually stored at TDS. However, with the rapid expansion of the missile program it was recognized that this system needed overhauling. Filing took too long and retrieval took even longer.

Faster Data Needed

Operating units had to have proper and up-to-date information in order to repair, service and fire the missiles. Procurement needed quicker access to diagrams, drawings and specifications in order to obtain needed repair and replacement parts.

After two years of study it was decided that a combination of microfilm aperture cards and Wright accounting machines would solve many of these problems. Thus the documents could be filed and retrieved mechanically rather than manually. Two Recordak 35mm cameras were bought so that TDS could begin miniaturizing documents. The film was sent to an outside processor for developing.

During those early months one of the difficulties which had to be overcome was the maintenance of a complete, uninterrupted manual system while the conversion to aperture cards and accounting machines was taking place. This meant that for several months two separate and distinct systems had to operate.

Today Watland, Inc. of Chicago is under contract to carry out most microfilming as well as to operate TDS. Project contractors, engineering firms and MSFC engineers designing missiles or parts of missiles forward original drawings to TDS. There they are logged in and then dispatched to the microfilming department. Each drawing or document is subsequently recorded on log sheets which will be used for keypunching and verifying the IBM aperture cards. Information recorded includes code number, drawing number, drawing revision, sheet number and number of sheets for each drawing number, camera letter

TOP, TDS at work. Below, file of 850,000 drawings fits along one wall.

OVER 30,000 drawings per month pass beneath this camera.

for ocket Readiness

INDUSTRIAL REPRODUCTION

with film roll number and frame exposure number.

Two exposures have been made of each drawing, and the roll is developed as archival microfilm by Watland's microfilm laboratory in Blue Island, Ill.

"Inhouse" Processing

New drawings are microfilmed and processed "inhouse" when the demand is urgent. After a quick copy is made, the drawing is then exposed and handled as archival film. Meanwhile two duplicate sets of log sheet information have been kept at the TDS. One set is used to keypunch master IBM cards to represent the drawings microfilmed. The other set, having the same information, is used to verify the master cards. When these are made, discrepancies in logging, sequence and keypunching are found and corrected.

The master cards are then passed on to a Filmsort Automatic Card-to-Card Printer, which reproduces similar decks of aperture cards that include end-printing and gang-punched deck code. As many new aperture card decks are made as are required to be sent to other organizational segments at the center and to other government services and prime contractors for the missile projects.

Reproduced aperture cards are interpreted to read the punched information regarding each microfilmed drawing which will be inserted in a card. Complete aperture cards plus the second set of log sheets — which are used to check the sequence of aperture cards — are sent to a mounting group for correlating with the processed roll of film.

The film is mounted into its respective aperture card, and filmed drawing numbers are matched to the printed card number for 100 per cent verification. The cards are then sorted into numerical drawing number sequence, forwarded to organizations at the Center, to other government installations, and to concerned industrial contractors.

A rather recent development is that certain prime contractors and suppliers submit their engineering data directly on microfilm already mounted into aperture cards. The new policy has not only eased the demands on TDS's camera equipment, but has saved in trans-shipping costs to the fifteen distribution points.

Once the film is in cards copying becomes the next step, since both engineering and procure-

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INDUSTRIAL REPRODUCTION

Some Simple Repro Aids

by HAL DENSTMAN and MORT SCHULTZ,
Lockheed Electronics Co., Stavid Division

Technicians in in-plant operations can now have available to them certain equipment for improving, changing and even originating a mechanical layout for reproduction to a master.

The following are some of the more versatile and easy-to-handle devices you can use:

Mechanical Devices: For years, mechanical means of lettering have been employed by draftsmen and artists. There is no reason, however, why the reproduction technician cannot employ such lettering equipment as Letterguide, Leroy, Wrico and Varigraph.

All kits include a large variety of styles and sizes that produce good quality letters and symbols. Many types of unique and attractive lettering varieties are possible with these kits such as shadow, reversal, curved and circular lettering. Inks employed with these mechanical devices can be applied directly to originals and intermediate masters.

A complete set of mechanical lettering guides, including pens, is relatively inexpensive and can handle your emergency needs. In many cases, you probably would not need a complete set, but could accomplish your work with just one portion of a lettering kit.

Photo-Composing Machines: Many inexpensive photo-composing machines, such as Headliner, Protype and Filmotype, are available to satisfy reproduction laboratory mechanical requirements you may have.

Information is prepared in the form of a positive or negative image, whichever is desired, and is pasted up on the mechanical layout. In most cases, the image produced by a photo-composing machine is suitable for diazo printing.

Type is set quickly and accurately by inexperienced personnel, who simply punch keys similar to a typewriter's or dial the letters they want. The machine does the rest, with the film being developed either automatically inside the machine itself, or in external trays or tanks.

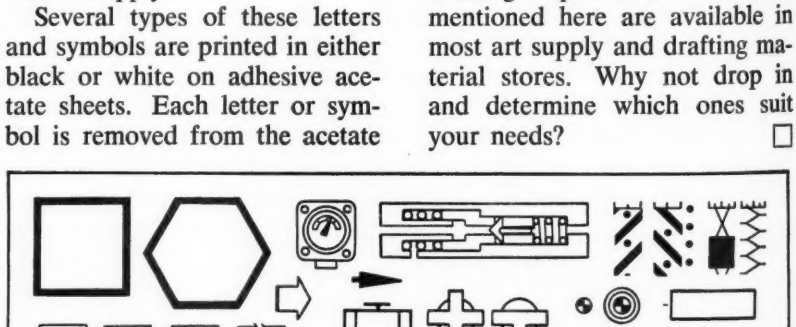
Commercially Prepared Letters & Symbols: These materials, which carry such trade names as Para-Type, Craft-Type, Ar-Type, and Foto-Type, are available in many sizes and styles. They are extremely easy to handle and add a professional touch to a layout, requiring little time to apply.

Several types of these letters and symbols are printed in either black or white on adhesive acetate sheets. Each letter or symbol is removed from the acetate with a razor blade or sharp knife and is simply pressed into position.

Commercially prepared letters and symbols can be used for photographic reproduction or on a diazo master, providing they are heat resistant. They are extremely sharp and clear in character, with excellent light-blocking characteristics. Areas around symbols and letters are transparent and are not visible on a white print.

Instant-Type: A new development, this excellent device is applied by a transfer process. Instant-Type letters and symbols are positioned either on the translucent master original drawing or on the mechanical layout by rubbing them on by pressure to the backing.

These devices will permit you to give your work a truly professional appearance without relying on the services of an art or drafting department. All items mentioned here are available in most art supply and drafting material stores. Why not drop in and determine which ones suit your needs? □



NEW MINOLTA SR-3

NEW
1/1000 second shutter speed
For action stopping power and depth-of-field control.

NEW
Split-image focusing
Critical focusing in any light with precision prism rangefinder and groundglass focusing.

NEW
Detachable Meter
Super-sensitive accessory meter couples to shutter, is easily removable.

NEW
f/1.8 Rokkor lens
Ultra-sharp rare earth lens is result of latest optical calculations and techniques.

Minolta SR-3 features read like a checklist of professional needs. Instant return mirror, automatic diaphragm, speeds up to 1/1000, combined split-image and groundglass focusing, non-spinning speed dial, click-in half stops, self-starting counter, self-timer, rapid advance, rapid rewind, and many, many more.

Complete range of accessories and interchangeable lenses. *Ten lenses* cover focal lengths to 600 mm for every use from sharp-cutting copy work to dimmest available light shooting. *Twenty-eight accessories* adapt the SR-3 for everything from radio remote control to photomicrography. All lenses and accessories for the SR-1 and SR-2 fit the new Minolta SR-3.

If your dealer does not carry Minolta Cameras, send $199.50 plus $10 handling and shipping costs for the Minolta SR-3, with double coated 6-element, 55mm f/1.8 automatic Rokkor lens. Case $15.00, detachable meter $25.50.

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SHOOTS 9' DRAWING DOWN TO 3" SIZE . . .

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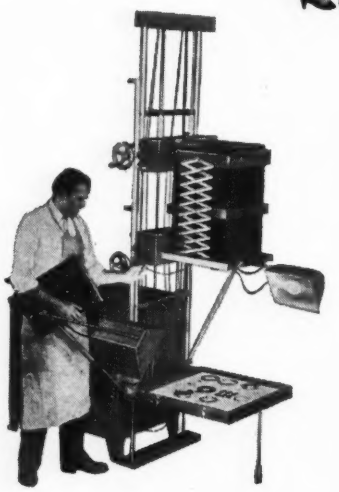
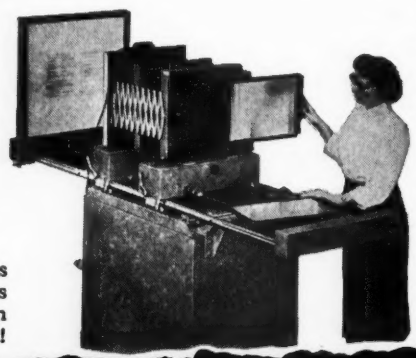


9:05 A.M.

SHOOTS "EXPLODED VIEW" FOR INSTRUCTION MANUAL . . .

Same Camera! Only Now Performing in VERTICAL position shooting 3-Dimensional copy! The Shadowless "Back-lighting" Eliminates Costly Outlining! Makes Copy Negatives and Silk Screen Negatives to 17 x 17"!



9:10 A.M.

MAKES EKTALITH MASTERS . . .

Ready for the Press—As Well as Xerox and Gevaert Masters . . . Takes other Backs to Accommodate Film Sizes from 19 x 19" to 2¼ x 3¼"!

Of Course It's A Princeton "TRI-DIMENSIONAL" Camera

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continued from page 33

and a film Newtonian optical system built by Perkin-Elmer. Using 70mm film, it records 20 frames per second at a slant range of 75 miles. In this instance it revealed (on a 16mm reduction of the original 70-mm Ansco film) that the second stage ignited before the first stage was separated. *(See Fig. 6, P. 33)* Necessary fixes were immediately obvious. This is just one instance and not an isolated one where photography saved money and man-hours in missile development.

This time they called on ROTI. Another long "eye" they might have utilized is IGOR (Instrument Ground Optical Recording). *(See Fig. 1, P. 32)* IGOR is photographically similar to ROTI, with a basic 90-inch optical system which can be amplified to 500 inches, using a Flight Research Model V camera that takes 2¼ x 2¼ pictures on a 1000-foot roll of film at a frame rate of 10-60 fps. *(See Fig. 2, P. 32)* Sometimes a 35mm Mitchell high speed camera is used instead for special effects. Ballistic camera plates from two or more locations, through a system of triangulation, give engineers the most precise measurement of exact missile location in space. *(See Fig. 3, P. 33)*

All launch complexes are equipped with an umbilical mast which serves to carry air conditioning ducts and electrical power to the missile. *(See Fig. 5)* This mast also serves as a camera unipod for close-in surveillance. Cameras are mounted at three points on the mast — top, half-way and bottom. The top camera views the umbilical connection to confirm that the disconnect at lift-off is clean. The half-mast camera is placed to note any missile malfunction as well as pad damage or damage to ground support equipment. Many changes to component parts of ground support equipment have been effected from information obtained from half-mast cameras. The lower mast camera is placed to study the verniers and the main engine chamber and see if the launch arms retract properly. *(See Fig. 8, 9, P. 32)*

continued on page 58

When you need the picture...

In the photo above, *the egg* is the story-telling focal point of the composition. The mechanical hand is a development of the General Electric Company and is used for the handling of radioactive material.

you need a GRAPHIC*

The Burns Brothers, George, James and John of Schenectady, N. Y. have been photographers for 25 years. Their work has included everything from County Fairs to heavy industry. And they agree that, "In every situation where we have been called upon to produce high speed action at the exact moment, or a photograph involving design and composition, *the Speed Graphic has been a faithful asset.*"

*Trade Mark. For information on the complete line of 4 x 5 Graphic cameras and accessories, write Dept. IP-61, Graflex, Inc., Rochester 3, N. Y. In Canada: Graflex of Canada Limited, 47 Simcoe St., Toronto 1, Ont.

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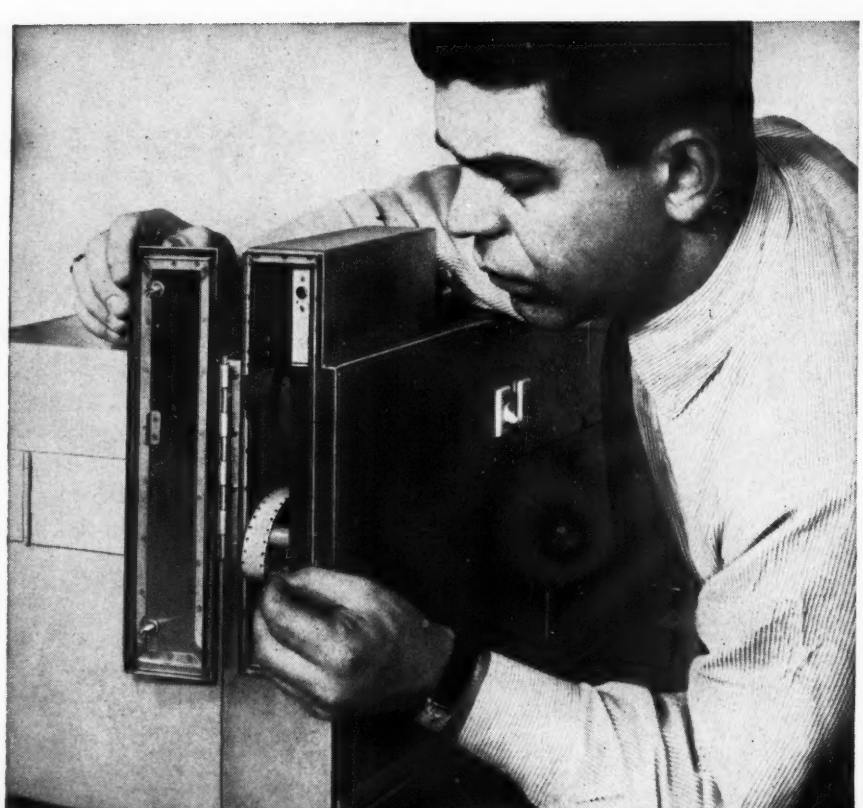

MINI-RAPID PROCESSOR DEVELOPS DATA DISPLAY FILM RECORDS–FAST!

See your data display film records in minutes. Fairchild Mini-Rapid Film Processors give you automatic delivery of negatives – developed, fixed, washed, dried – commercial quality.

16mm films up to 6 f.p.m.

35mm films up to 4 f.p.m.

Oscillograms, digital or analog display, radar, meters, gauges, controls – any information display that you record on 35 or 16mm film can be read back just a few minutes after your film is inserted into the Mini-Rapid.

Operation? Easy. Insert a few inches of film into the loading compartment, drop in spool, close door. Automatic transport takes over and does the rest.

Write for illustrated specifications and prices to Industrial Products Division, Dept. IP-6, Fairchild Camera and Instrument Corp., 580 Midland Ave., Yonkers, N. Y.

MINI-RAPID FEATURES

- capacity up to 400 feet
- table top compactness
- dual thermostat control
- completely automatic
- leaderless daylight loading
- self-threading film transport

Pre-packaged, pre-measured liquid chemicals available from Fairchild means you don't have to add, reduce or measure ingredients. You simply mix and load. No darkroom or special skills needed, either.

INDUSTRIAL PRODUCTS DIVISION
FAIRCHILD
CAMERA AND INSTRUMENT
CORPORATION

Circle No. 546 on Post Card

continued from page 56

Because they were light and compact, 16mm Cine Specials set at 64 fps were initially used as mast cameras. Now the newer Milliken is generally used with Commercial Ektachrome.

Around the launch area, generally, a wide variety of cameras are to be found; as a rule each missile test is covered from upwards of 25 camera locations. These include 16mm, 35mm and 70mm cameras from Cine Specials and Mitchells to Hulchers and Photo-Sonics. Each camera, well reinforced to hold up during blastoff, fills a different information requirement. In missile research, cameras are also situated on the tracking site outside the danger zone. These are 16mm and 35-mm movie cameras, regular and high-speed, used with long-focus lenses. Two such cameras, a 35mm Mitchell shooting at 24 fps and located 4,500 feet from the missile and a much-closer-in 16mm Fastax shooting 1,000 fps, solved the mystery of why a Titan blew up at ignition. The shock of the Titan's 300,000 pounds of thrust had triggered the Primacrod destruct package; a new type of relay stopped that.

Another valuable camera tool is the Mark 45 tracking mount. Adapted from an anti-aircraft gun mount, it is electrically operated and has carried as many as 10 cameras although two or four are the normal load. Its smooth response makes it ideal for long lens work up to 120 inches.

When an explosion wrecks the close-in cameras, destroys the electrical system and eliminates telemetry signals, motion picture film from cameras on the Mark 45 may be the sole source of clues as to what happened. Of course, not to be forgotten are the still cameras situated in the tracking area for both pictorial and documentary coverage. Cameras such as a Deardorff 8 x 10 have yielded some of the finest record shots.

Thus far we have talked about what the *cameras* do but it is the

continued on page 60

Here's why YOU need the HONEYWELL REPRONAR

Remember when the end product of nine out of ten jobs was a stack of black and white prints? Then, about all your lab needed was a camera, lights, an enlarger, and perhaps a contact printer. Once in a while a color job came along, and you took it in stride, but you were never able to achieve the flexibility and freedom of expression you enjoyed in black and white work. Cropping and enlarging of transparencies just wasn't done, and even the job of making 1 to 1 dupes was usually sent out to a specialist.

Today, you're probably spending more time and money on color work than ever before. That's why you need the Honeywell Repronar. With it, you can perform color processes you formerly farmed out, and besides saving time and money, you get better results because *you're* in complete control. Here are just a few of the jobs you can do with this versatile instrument:

You can make unlimited duplicates of original 35mm transparencies, quickly and economically; you can correct under—and overexposed transparencies and change color balance; you can reduce 2¼ x 2¼" transparencies to 35mm; crop and enlarge portions of original transparencies; produce and duplicate 35mm filmstrips in B&W or color; create special effects; make color negatives, and perform many, many other processes in color and black and white. Sound good? Users tell us the Repronar is the most useful new product since color film itself.

The Repronar consists of a precision 35mm copy camera coupled to a Strobonar electronic flash light source. Camera and bellows are both fully movable, permitting enlargements up to 4X, and a built-in exposure scale makes settings foolproof. You get filters, slide holders, lens cap, and a dust cover. All this, yet the Honeywell Repronar costs no more than $350. See this remarkable instrument at your Authorized Honeywell Photo Products Dealer's now!

For a full color folder on the Honeywell Repronar, plus a no-holds-barred evaluation by Simon Nathan, write to: Minneapolis-Honeywell, Heiland Division, 5200 East Evans Avenue, Denver 22, Colorado.

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to
FINISH

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RESEARCH

continued from page 58

men behind them that make them work. Our most important asset is still the photographer. A fine example of this came about when a propulsion specialist said, "Gee, if I could only see what that engine is doing at ignition and lift-off, I think we would solve some of our problems!" Bill Gibson, then Douglas Aircraft photo coordinator at the Cape, went to work. Obstacle after obstacle confronted him. Working engineers were loathe to authorize any extraneous material in this critical area. Shock and vibration would separate the lens elements. Temperatures would destroy the cameras at every launch. The firex system water would soak the film. To overcome these hurdles, Bill started with a couple of shoe boxes, taped down in possible camera locations. After the launch he found that the air pressures and vibrations evidently were intense for the boxes were crushed. However, temperatures were apparently much less than anticipated since burn damage was slight and the shoe boxes were reasonably intact.

Next, to pinpoint the temperature range and find the coolest part for camera mounts, thermo paints were striped inside the ring and on front and sides of quarter-inch welded steel camera protection boxes. Temperatures were found to range from 200 to a little over 1000F, much lower than anticipated. The first camera used was a Traid with a makeshift protective housing.

Successive tests proved that ring cameras were both feasible and successful and resulted in semi-standardization. In place of a makeshift housing, the cameras are now encased in a steel protective cover, anchored with wingnuts that are braced to prevent swiveling. The shooting port is clear safety plate glass. A Polaroid filter, cutting light transmission approximately 40%, is fitted over a 13mm lens. Two-hundred fps was determined as the best rate although different speed rates are used in different tests. The usual camera is a Milliken but Cine Specials, Fastax's and others have been used on several occasions.

Such cameras have been tremendously successful. Approximately 20 engineering change needs were discovered by the ring cameras on the Thor missile alone. Exchanges of information of this sort among the other missile programs — including Army and Navy projects — have saved tremendous quantities of time and money. It is worth noting, too, that on the entire Thor research and development program only two ring cameras were lost.

Photography is more than a supporting research instrument. At times, it has been the only one available. Remember the famous Thor blowup that came five minutes before time for engine ignition? With loss of power there was no telemetry. Nor were there any close-in cameras functioning because it was too early for the automatic start. And no operator was near a still camera. Only one hope remained: accidental footage taken by motion picture cameramen who periodically check their lenses and fire short bursts of film. They do this at the Cape to make sure that emulsions are not sticking to the gate, a nasty side-effect of the local humidity.

While roll after roll was processed, speculation as to the cause of the explosion ranged from lightning bolts to flying saucers. Finally came the cry, "Eureka". The answer was on 16 precious Ansco frames. Each frame was blown up to 4 x 5 and passed on to the engineers. Each frame was also printed 40 times in consecutive sequence for projection. In one of the "hold" frames the red-dyed fuel was seen spilling from the tank. *(See Fig. 4,* P. *32)* To engineers familiar with the system the message was loud and clear — a minor component failure. While nothing similar has happened since, it has been a general practice to have one or more emergency cameras watching the missile at certain critical periods and during the last 30 minutes before launch. This emergency film is exposed at 24 fps but is processed only if telemetry has indicated the possibility of a momentary malfunction which might be confirmed by the film. □

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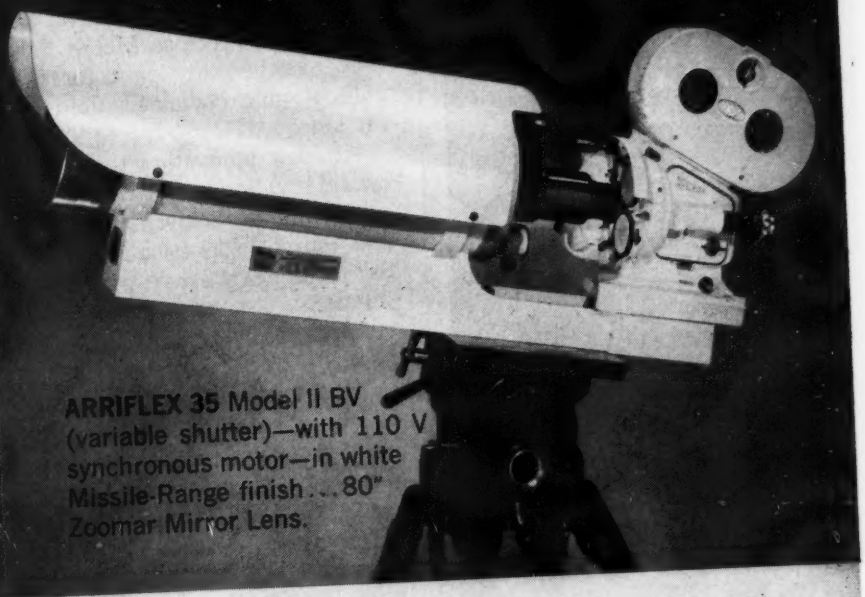
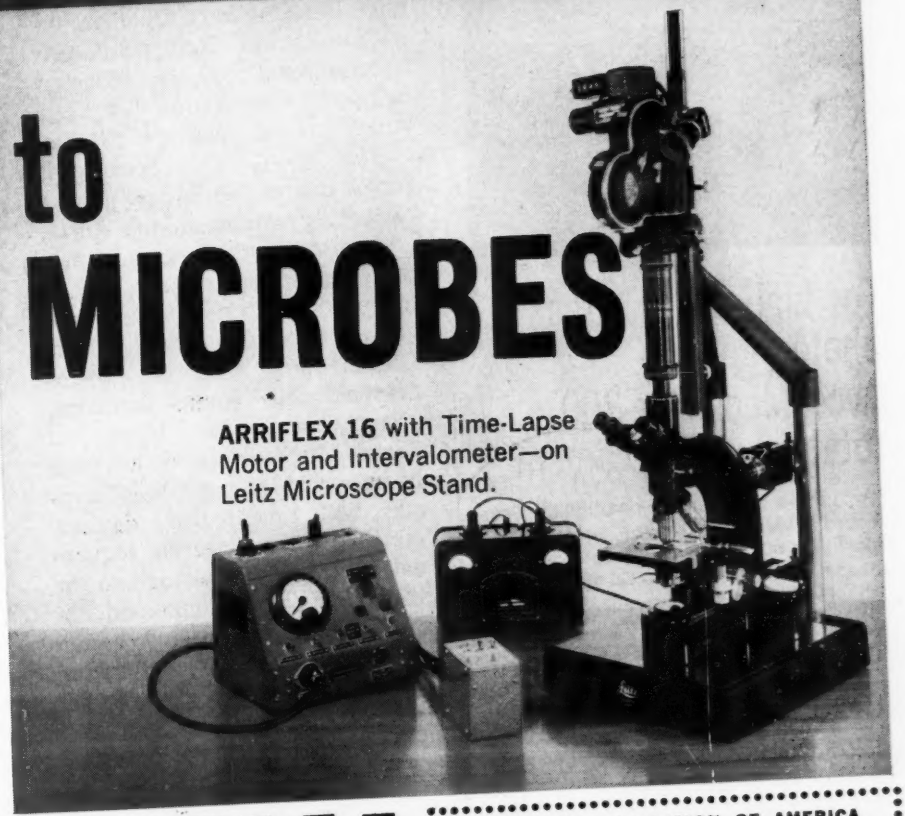


ARRIFLEX 35 Model II BV (variable shutter)—with 110 V synchronous motor—in white Missile-Range finish . . . 80" Zoomar Mirror Lens.

to MICROBES



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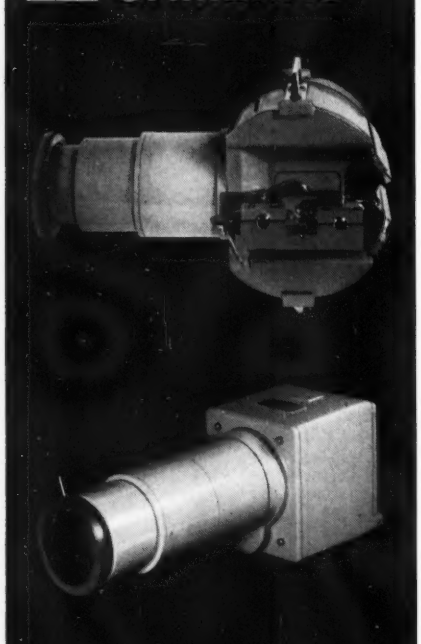

For high-speed streak photography:
Avco Model Me-300 rotating mirror camera

(Top) For a continuous, position-vs-time record • Maximum mirror speed, 3000 rps • Writing rate @ 3000 rps, 3.8mm/msec • Total writing time, 50 msec • Lens adjusts f/2.5-f/16 • Film size, 2¾" x 16".

Avco Model Dc-000 rotating drum camera

(Bottom) May be used alone, or with spectrograph or Schlieren system • Maximum drum speed, 600 rps • Writing rate, .19 mm/msec • Total writing time, 1667 msec • Lens adjustable f/2.5 to f/16 • Film size, 3" x 12.56".

AVCO
Research & Advanced Development division

Industrial Products Department
Wilmington, Massachusetts

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TOMORROW'S FILMS

continued from page 40

electrolytic cells. The silver is returned to Precious Metals Salvage and partially pays for the photographic chemicals used by the lab.

Another innovation that helps cut production costs is an arrangement for rejuvenating color and film bleach, usually one of the most expensive processing solutions. At most photo labs, color bleach is usually discharged as waste.

Much of the credit for this lab, which replaced an obsolete one early last year, belongs to E. B. Brady, RCA Engineering Coordinator, W. F. Bischof, RCA Photographic Production Processing Manager, and Major R. L. Jarman, Chief AFMTC Photographic Coordinator. Construction was accomplished by the Houston Fearless Corporation of Los Angeles, California.

The lab is large because it serves one of the largest motion picture operations in the world.

At Canaveral all types of motion picture cameras are utilized for producing documentary and vital engineering data films. Documentary films are photographed with 16mm Auricons, 16mm Cine Specials, 16mm and 35mm Mitchells and with 35mm Eyemos. More specialized cameras, with time register devices, are used for engineering sequential coverage. These include the 16mm Milliken, 16mm and 35-mm Fastax, 16mm and 35mm high-speed Mitchells and 35mm and 70mm IGOR and ROTI tracking telescopes.

The various cameras are set up and operated by RCA cameramen, who are contracted to the Air Force for this operation. Some special reports are filmed by one of the Air Force's own units, the 1365th Photo Group, with headquarters in Orlando, Florida.

The footage obtained provides accurate pictorial data of missile tests for engineering groups and military and government agencies. Much of it goes to make up contractual quarterly reports, monthly "inputs," and special motion picture releases shown to the public.

What Hollywood is to entertainment films, Cape Canaveral is to space technology movies. □

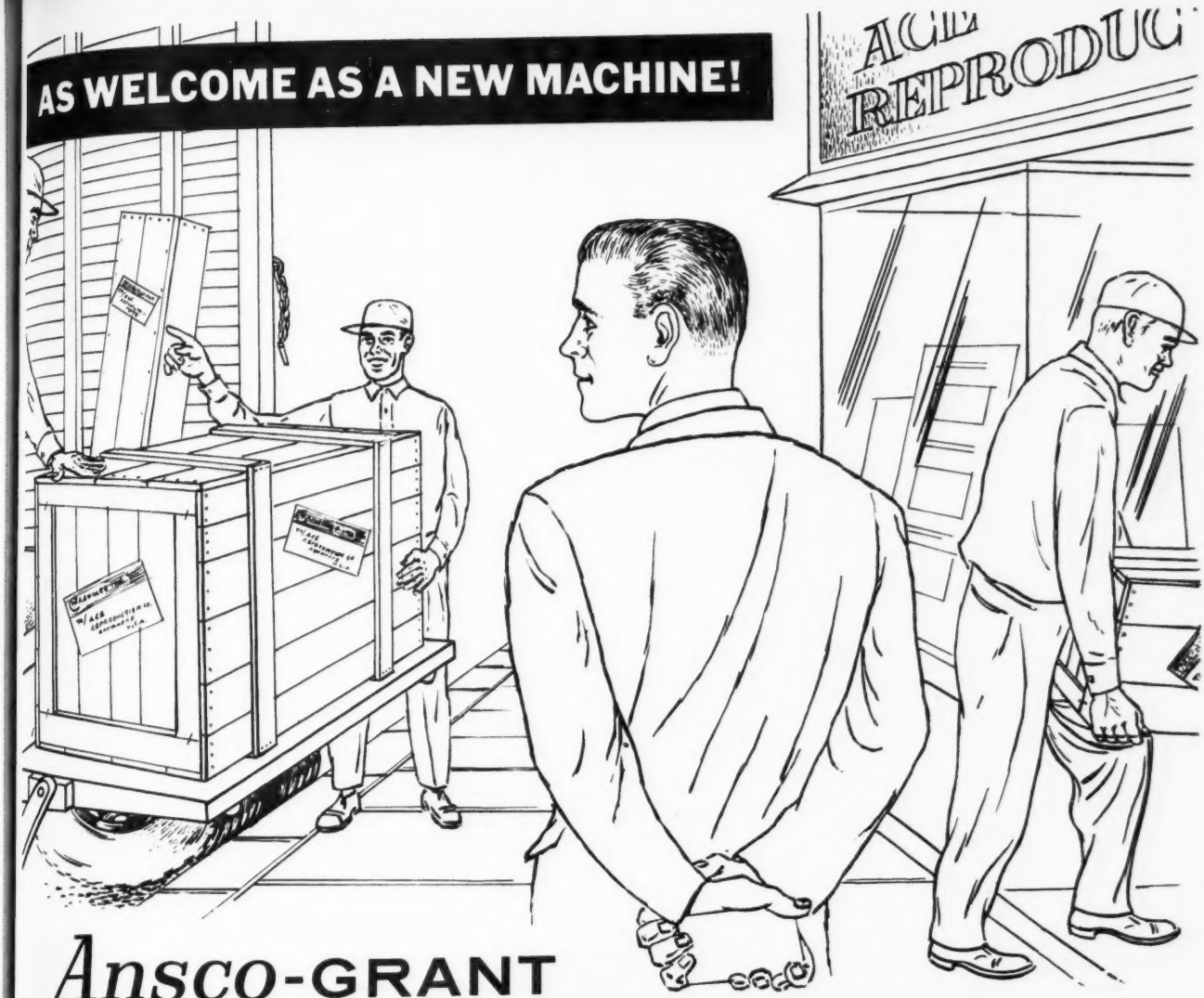
NASA

continued from page 30

Thus far, NASA's Washington Motion Picture Headquarters (Audio-Visual Section) has acted as a coordinating and library facility rather than as a production center. Storing 50-75,000 feet a month, chiefly from Canaveral, an 800,000-foot library has been set up in less than a year under movie chief, Byron Morgan, Chief, Audio-Visual Section. Industrial, historical and allied footage is physically stored at Byron Laboratories, Washington, D.C. while strictly research and development footage is kept at the field centers. This is kept track of under a filing system which is an adaptation of the Navy Cardex system which files footage by scenes with details of individual shots within scenes. At present some 500 categories are included.

The only actual movie services provided at headquarters are simple editing. Everything else is done on contract. When studio footage is required for a film on which the A-V section is producer, it is shot under an Air Force contract which has been subcontracted to NASA. However, most films are put together, under contract, from stock footage. Distribution, again, is handled by contractors.

This brief look at the role of photography at NASA's farflung installations can only hint at the scope of the work it does and the aid it renders. Like everything else connected with NASA's space program, it is probing a frontier that has beginning but no end. □



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related reading

Exakta Manual

by W. Wurst, Fountain Press, New York, 420 pp., $7.95.

In the words of the camera's manufacturers, "this is the most complete book on the Exakta ever written." It explains in detail the mechanics, techniques and applications of this brand of 35mm camera. Points made are illustrated by 223 pictures, diagrams, schedules, tables and drawings. There are chapters dealing with portraiture, nature studies, sports, flash, strobe, lighting, filters, close-ups, duplicating slides, medical and dental photography.

Color Photography Outdoors

Eastman Kodak Company, Rochester, N. Y., $1.

A completely revised second edition of a data book that explores all aspects of the subject from aerial techniques to underwater exposures. It discusses the possible variations in daylight color quality, how to control outdoor lighting contrast, what filters should be used for daylight and how to determine proper exposure.

Audio-Visual Resources For College Teaching

University of North Carolina, Chapel Hill, N. C., 17 pp.

Although concerned with how one university is using audio-visuals, most of the techniques covered can be applied to industry.

IP Index

Soon to be made available is the index of articles and features which appeared in INDUSTRIAL PHOTOGRAPHY last year.

Negative Making For Professional Photographers

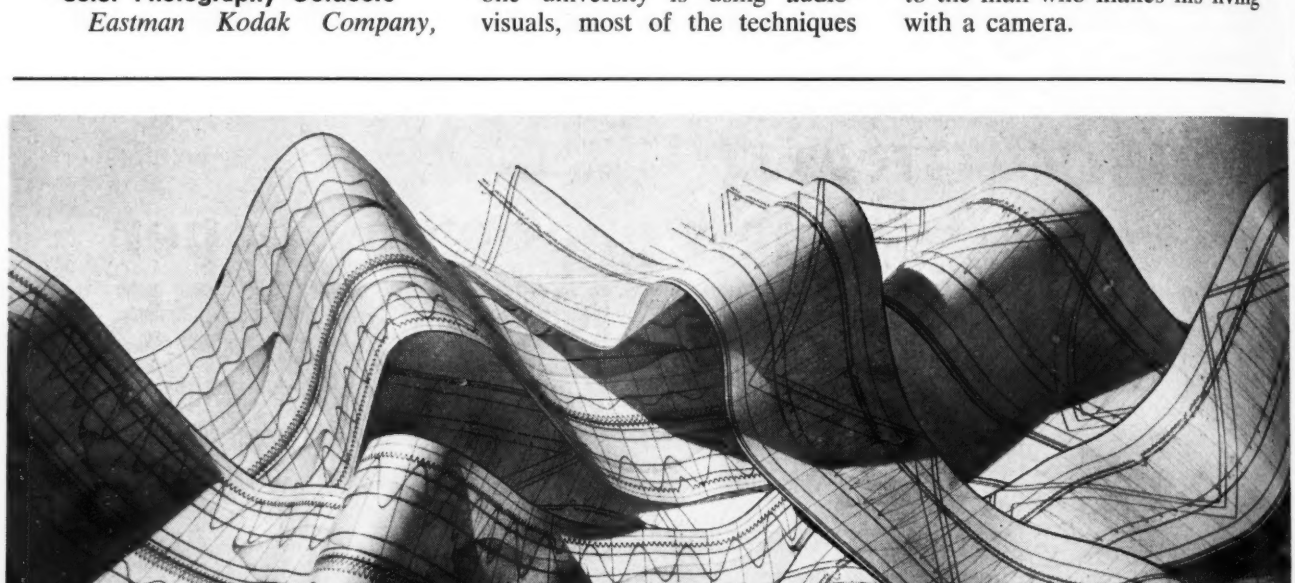
Eastman Kodak Company, Rochester, N. Y., 64 pp., $.75.

A thoroughly revised second edition. It offers recommendations on exposure selection and processing conditions.

Creative Camera Techniques

by Burt Murphy, Universal Books, New York, $1.95.

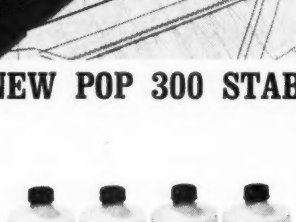
More for the amateur than the professional, but still, some of the information may prove valuable to the man who makes his living with a camera.



JUST ADD WATER–CEC'S NEW POP 300 STABILIZES PRINT-OUT RECORDS

Just add water. That's how simple it is to produce stabilized print-out records of unusually high quality with POP 300. This newest development in CEC's complete line of photographic recording supplies eliminates the mixing of dry chemicals.

Packaged as a stabilization kit of four quart bottles of liquid concentrates, POP 300 is designed specifically for use in CEC's 23-109 Oscillogram Processor to stabilize Eastman Linagraph direct print paper.



POP 300 is available at all CEC sales and service offices . . . and from warehouse stocks carried in Pasadena and in Philadelphia at CEC's new Technical Supplies Office.

For complete information, write for Bulletin CEC 1639-X5.

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How professional should a camera be?

How much camera should a pro invest in?

First, it depends on the features he needs. If he's like most pros he can't begin to itemize the hundreds of different types of jobs he handles—everything from portraits to microphotography. In the long run he might wind up buying half a dozen "specialized" cameras to fill his requirements.

The single lens reflex Hasselblad eliminates this. With *one camera*, plus interchangeable accessories, you can get over 100 combinations, and set up in seconds for practically every shot known to photography. Four different lenses, three film magazine sizes plus a sheet film holder, four types of viewers—everything changes. The Hasselblad makes it absolutely needless to carry more than one camera on an assignment.

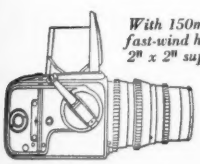
Next, a pro wants quality. How much? Enough to guarantee him perfect results under any circumstances. After all, his living depends on it.

Take the Hasselblad lenses. No scrimping on quality here! Each one is made by Carl Zeiss and has its own Synchro-Compur shutter and automatic diaphragm. Resolving powers permit greater enlargements than virtually any other lens made. For studio work, *color and detail is up to the best you ever got.*

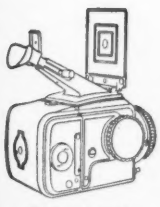
The precision single lens reflex system, of course, completely eliminates parallax. Focus and depth of field appear on the print-size ground glass just as the film will take them. A pop-up magnifier allows you to focus accurately on minute details. There are no surprises waiting for you in the darkroom with a Hasselblad.

Even the ***"conveniences" on the Hasselblad***, the EVS system, automatic diaphragms (which can also be set manually), and automatic safety devices are to make assignments easier and free you to concentrate on the job. When you use an instrument every day, you have a little convenience coming to you.

How professional should a camera be? As professional as a Hasselblad, *no less.* With Zeiss Planar 80mm f/2.8 lens, $549.50, including F.E.T. Write Dept. HIP-6 for literature and the name of your nearest Hasselblad dealer. PAILLARD Incorporated, 100 Sixth Ave., New York 13, New York.



With 150mm lens, fast-wind handle, 2" x 2" superslide back

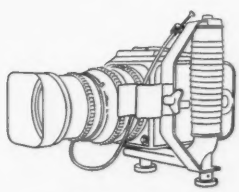


With prismatic sports finder

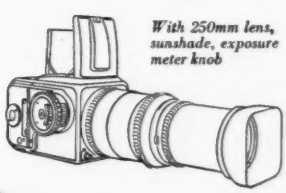
With magnifying hood, 60mm lens, back for 16 1⅝" x 2¼" exposures, exposure meter knob

With sports finder, camera grip, 80mm lens

With magnifying hood, cut film adaptor and holder



With 150mm lens, sunshade, flash gun bracket, back for 12 2¼" x 2¼" exposures



With 250mm lens, sunshade, exposure meter knob

HASSELBLAD

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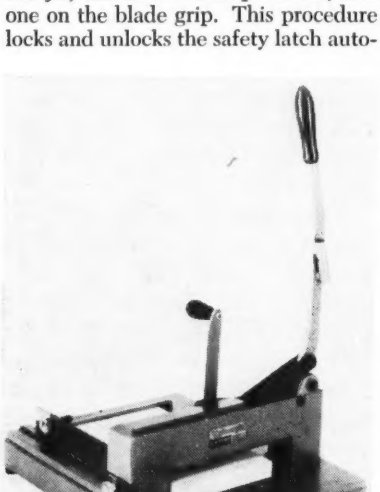
NEW PRODUCTS

continued from page 16

Called the Triumph-Jr., the cutter utilizes a unique device which eliminates a clamping hand wheel. One simultaneous motion clamps and cuts the paper. As a special safety feature, both hands must be used to operate the Jr., one on the clamp handle, and one on the blade grip. This procedure locks and unlocks the safety latch automatically. The unit has a 10" cutting width and can handle stacks 1¼" thick. A 12" inside cutting length can be increased to any length desired when the back gauge is removed. Price: $119.

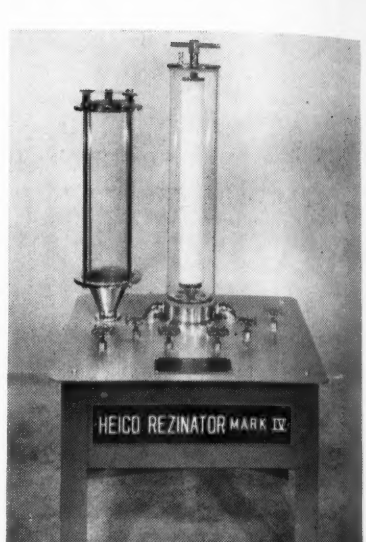


Long Lens 110

Birns & Sawyer has introduced a 1000mm Omnitar telephoto lens which may be adapted to cameras ranging in film size from 16-70mm. The angle of view is 3° and the lens focuses from 67′ to infinity. Mounts for the *f*/6.3 lens include adapters for the Cine Special, Fastax, Mitchell and Nikon Reflex. Proper support for the long lens is provided by the Mark III Omnipod which is available in specific models for different cameras. Net weight of the lens is 14 lb., 4 oz. The finish is a light grey. Price: lens, $795.

Water Purifier 111

A completely automatic system designed to deliver quality-controlled water for photographic processing is now being offered by *Heico Incorporated*. Called the Rezinator Mark 1V, it chemically treats the water to remove materials such as iron, copper, sulfur, chlorine, algae, and bacteria. Capacity of the 30 x 30 x 60"-unit is 25 gallons per minute, at pressures up to 100 psi and temperatures up to 200°F. The device should be of special interest to color processing labs, where impurities in water can affect print quality.



Tape Recorder 112

Rheem Califone Corp. has introduced a monaural tape recorder designed for hard, continuous use as in

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gives you a choice of 2 completely portable movie film laboratories...

for ready-to-project movie film in 60 seconds!

RAPROMATIC – the revolutionary pre-saturated Raproroll® web technique – now offers you two self-contained completely portable laboratories for fastest on-the-spot processing to a negative. No pumps, no applicators, no free flowing fluids – no additional equipment needed. Superior image quality, maximum contrast, fog levels as low as 0.01, resolution retention at all cine rates. Unlimited applications for instrumentation recording, sporting events, oscillo recording, TV news, cinefluorography, industrial, microfilm, medical and other fields demanding immediate access to results.

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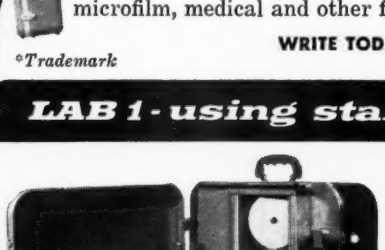
Magazine processor adapts any 16, 35 or 70mm cine camera to develop and fix film as you shoot. Spring loaded roller is only modification needed on standard magazines.



Rapromatic Model 410 Portable Washer-Dryer
Companion unit for magazine processor or portable processor. Weighs only 30 pounds, operate from normal house current. Static wash-dry speeds adjustable up to 25 ft./min.

Rapromatic Model 470 Portable Processor
Develops and fixes 16, 35 or 70mm film at speeds up to 50 feet per minute. Weighs only 30 pounds, accommodates reels up to 400 feet. Motor drive, hand crank for field use.

LAB 2 - using Rapromatic magazine

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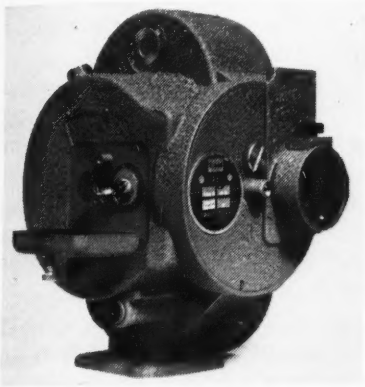
training programs. The model Califone Comet 70-T is housed in an attractive, rugged case with metal corners to withstand rough treatment. The two-speed tape deck features a no-spill transport and kick-proof speaker grill. Output is 6 watts peak with a frequency response of ±2 db., 50-15,000 c.p.s. Price: $199.50.

Tracking Camera 113

A 35mm lightweight tracking camera which features a special gear access door for change of speeds has been announced by *Traid Corp.* A 36° shutter is standard equipment on the Model 75A which weighs only 7



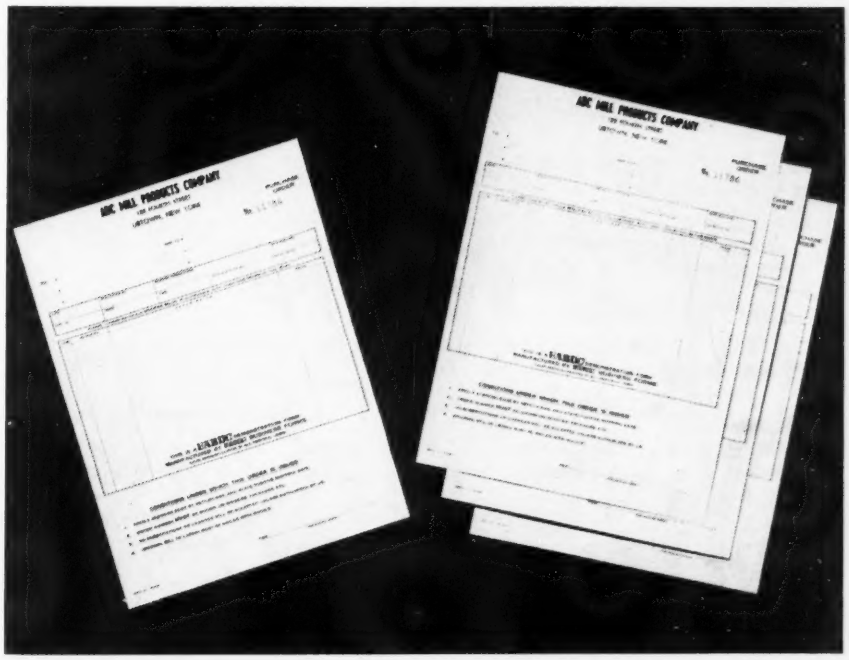
lbs. and measures 8" high. Camera speeds are 20, 40, 60 or 80 fps and these may be changed in the field in less than a minute. Film capacity is 100′ and Bell & Howell or Mitchell magazine adaptations are available. Power requirement for the motors is 5 amps. at 28 VDC and a separate 2 amp. circuit is required for the heaters which permits operation down to –20°F.

Automatic Projector 114

A completely selective slide projector with a capacity of 48 slides has been developed by *Spindler & Sauppe Inc.* Based on the design of the Selectroslide 750, the new unit, Model SLS-750, also uses the radial drum for holding slides, but this is controlled by remote push-button unit. The panel has 15 illuminated buttons which permit the operator to

continued on page 71

REPRODUCTION TRENDS



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Solve Reproduction Problems—No longer limited to copying just thin, translucent originals, recent POST progress in formulating superfast diazo compounds has added a new dimension to ammonia-process reproduction.

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More Competitive—Cost is a key word in the consideration of any new product. POST Super Vapo papers cost no more. Further, both large and small users will be quick to note that the combination of speed and economy basic to these new ammonia reproduction papers make them practical for longer runs —even 50 to 100 copies—and, less expensive than other duplicating methods often selected for such quantities.

Ask your POST dealer or write Frederick Post Company, 3662 North Avondale Avenue, Chicago 18, Illinois, for your copy of the Super Vapo Data File.

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MARSHALL MICROFILM

continued from page 53

ment need copies of all documents instantly available. The following methods are used for printing out data:

1. Card to Paper: For those needing paper copies in quantity TDS has installed a Haloid Xerox Copyflo printer which prints the microfilmed image from aperture cards onto either plain or reproducible paper at the rate of 20 feet of drawings per minute. The machine is able to print from 1 to 400 copies from any card by setting a dial.

2. Card to Paper and Viewing: Filmac 200 microfilm viewing machines have been bought in sufficient numbers to place them strategically throughout the engineering department. Engineers may view any of the drawings or produce 18 x 24-inch copies.

3. Card to Card: Two varieties of equipment permit printing from original cards to duplicards. One is a small, manually-fed Filmsort machine used for filling small requests. The other is the big automatic card-to-card printer used at an earlier stage to duplicate aperture cards.

4. Paper to Paper: An Ozalid Printmaster reproduces paper copies when an original must be duplicated for rapid distribution.

The first microfilmed drawing at TDS was mounted into an IBM card in 1957. Since that date over 7,000,000 microfilm frames have been completely processed. This figure represents about 850,000 documents, since some were photographed in two or more segments. In addition, a historic file of about 1,500,000 documents has also been transferred to unitized microfilm.

Future plans call for even further expansion of the microfilm facilities. Feasibility studies are currently being conducted on additional modifications of the system which will permit more rapid searching of filed microfilm documents. The use of closed circuit television to bring the material to engineers is another innovation being studied. ☐

MICRORECORDING AT WORK

Microrecording has grown by leaps and bounds during the past decade. With it has come a language that is often baffling to the newcomer. Here are a few of the terms used frequently by experts in the field:

Bleed Through — Extraneous photographing of back printed records when viewed from the front.

Blister — Small crater-like depressions; emulsion separated from film or paper base.

Block Indexing — A rectangular area used to define a document.

Blowback — To enlarge or make an enlargement of an image.

Camera — A photographic device employing an optical system used for taking pictures.

Camera Head — That portion of a photographic device which contains the optical system and sensitized materials.

Contact Paper — Photographic paper designed to be exposed when directly in contact with a reproducible document.

Contact Print — A reproduction made by exposure of sensitized material in direct contact with that which is copied.

Continuous Tone — Various shades of gray from white to black.

Diaphragm — A lens opening which determines the amount of incident light that can pass through.

Diazo — An organic light-sensitive dye, coated on a material, and processed by ammonia fumes or an alkaline solution.

Diffuse Illumination — Lighting so arranged that the object is illuminated from innumerable directions or sources.

Enlarging — The process of reproducing an image from a smaller image thru a projection process.

Epidiascope — A device for

continued on page 79

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Hundreds attend national photo-science show in Binghamton.

INFORMAL chats were order of the day at SPSE show.

SPSE HONORS TOP SCIENTISTS

Hundreds of the top-names in photo science and instrumentation gathered in Binghamton, N. Y., May 22-26 to attend the 1961 annual conference of the Society of Photographic Scientists and Engineers and to honor fellow scientists. Three scientists were honored with fellowship awards by the Society while three others were named senior members of the group.

Presented with awards as fellows for their "contributions to photographic science and engineering" were: Dr. Frank G. Back, Zoomar Corporation; Dr. Heinz Nitka, Ansco Division, General Aniline & Film; and Admiral Robert S. Quackenbush, Jr., Polaroid Corporation. Honored with senior membership for "extensive work on behalf of the national SPSE" were: George T. Eaton, Eastman Kodak Company; Ira R. Kohlman, Log-Etronics, Inc.; and Joseph Mangiaracina, U. S. Signal Corps.

Five days of programs covered almost every conceivable photo-instrumentation area for those attending. In addition, leading manufacturers exhibited their latest products and systems. Among these was Flight Research, Inc. showing films of typical photo-instrumentation functions; Log-Etronics displaying a CoLargetron; and Macbeth with an exhibit of densitometric equipment. □

WHO'S WHO of instrumentation manufacturers exhibited.

NEW PRODUCTS

continued from page 67

select any slide in the drum. The depressed buttons remain lit while the slide is on the screen. Depressing the appropriate buttons turns the projector off and puts the selector system in standby position. Five seconds are required for the drum to make a complete rotation and one second for the slide to move in and out of the magazine. A number of accessories such as a switch which limits projection to one minute for each slide and then turns the machine off until the next button series is pressed will be available.

Copier 115

A compact lightweight, desk model copier called the Polymicro has been introduced to the U.S. market by the *Burton Mount Corp.* The machine consists of two integral units; a developer and a same-size contact printer and developing section in the

form of a half-cylinder. The machine will deliver glossy and matte copies of normal office correspondence as well as halftones and small engineering drawings. Halftones glossies are said to reproduce well enough to be used as litho proofs. A translucent paper is also available for making tracings. The motor driven unit uses a special paper which is based on the principle of instantaneous development and stabilization. Price: from $175.00.

Slide Synchronizer 116

Adding sound to slide or filmstrip presentations normally requires the use of relatively expensive equipment or the services of an outside recording lab. In an effort to simplify the A-V specialist's job, *General Techniques Inc.* has developed a compact unit which promises to bring sound synchronized presentations well within the capabilities and budgets of industrial and educational users. The Mark-Q-Matic measures only 4" x 5" x 6" and contains no tubes or other parts requiring maintenance. It is used in conjunction with any tape recorder, no modification being required, and cues the tape by means of a pencil mark at the appropriate spot. Previous tape sync devices made use of slitters, electronic signals or self-adhesive aluminum strips to make contact or trip relays. The

continued on page 73

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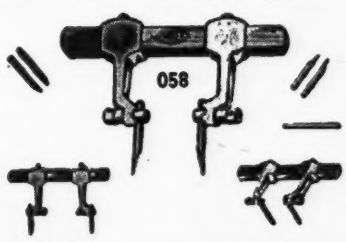

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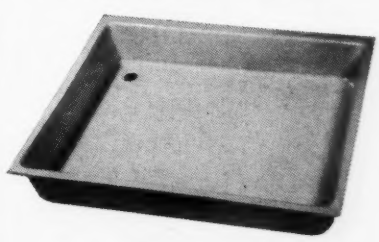

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RAILROAD FILM AIDS U.S. PANEL

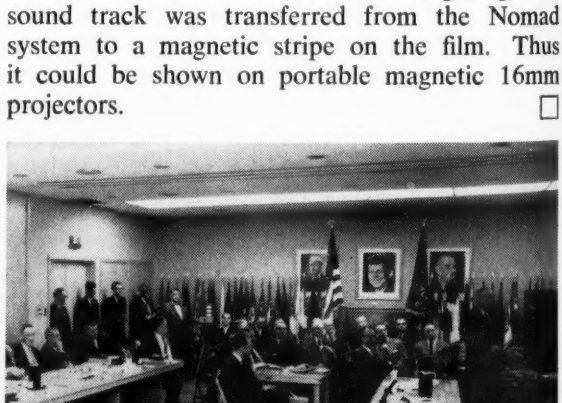
A labor-management dispute currently being examined by the 15-man Presidential Commission may be nipped in the bud thanks to a motion picture. The argument is over whether railroad companies should be allowed to determine when firemen are needed on diesels and other non-steam locomotives in freight and yard service.

To defend its side the Illinois Central Railroad has produced a 1¾-hour motion picture showing how its Chicago commuter service operates with only an engineer on each train. The film argues that if passenger trains can run without firemen in such a congested area freight trains should be able to do the same. The picture was made on the Illinois Central because its one-man operations are typical of others in the country.

J. T. Hawkinson, manager of audio-visual services for the company, produced the film over a year's time. It originally ran 10,000 feet but was edited to 3,000 feet for the Washington hearing.

Scenes of the film were shot in the Chicago subway system showing boarding passengers, headway and speed of trains, track layout, signals, etc. Only by using High-Speed Ektachrome film, fast lenses and obtaining the equivalent of an additional lens stop by shooting at the amateur speed of 16 frames per second was Hawkinson able to get adequately exposed film. Forced printing by a custom lab was also necessary.

One sequence of the movie contains ten minutes of lip-sync shot with the Nomad recording system. When the film was in the final editing stage the sound track was transferred from the Nomad system to a magnetic stripe on the film. Thus it could be shown on portable magnetic 16mm projectors. □



LEFT, commissioners hearing testimony of Joseph J. McCool at model board at right. In foreground are attorneys for the railroads, in background, attorneys for labor and spectators.

NEW PRODUCTS

continued from page 71

Mark-Q-Matic is much simpler and has the added advantage of identification of slide or frame number directly on the tape. In use, the tape is rerouted from the supply reel directly into the unit and then back to the recorder through the normal threading path.

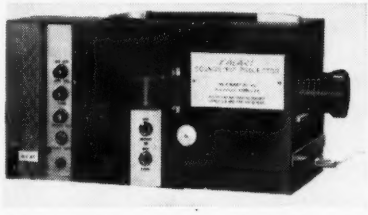
An adapter with the Mark-Q-Matic is provided for connection to the remote control outlet of most projectors. Mark-Q-Matic should be of great interest to those who have shied away from integrated presentations because of cost and complexity. Price $49.95.

Litho Film 117

A plasticized base litho film called Typon has been introduced by *Vero-Dot Film & Chemical Corp.* The economy film may be used for halftones and line work with equal facility. Because of its extremely dense background, over 60% of opaquing time is said to be eliminated. The ortho emulsion has a high sensitivity and may be used with all standard developers and fixers.

Sound Stripfilm Projector 118

An unusual development in sound synchronized filmstrips has been announced by the *Kalart Co. Inc.* Unlike conventional units that use a projector in conjunction with a separate



phonograph or tape playback, the Kalart Sound-Strip projector depends on a method of optically printing a sound track directly on the frame adjacent to the picture area. Both images take an area of 24 x 36mm, which is standard 35mm double frame. The track itself is "read" by a rotating light beam and a maximum of 18 seconds of recorded material may be printed on a frame. The machine uses either 300 or 500-watt lamps and weighs approximately 26 lbs. The film advance is of course automatic and threading is of the straight "push-through" method. Sound is provided by a 4-watt amplifier fed to a 6 x 9 oval speaker. Accessory remote control cord and single slide carrier will also be available.

Power Source 119

A nickel-cadmium battery pack with six to ten ampere-hour capacity has been announced by *Gordon Enterprises.* The lightweight source of

continued on page 80

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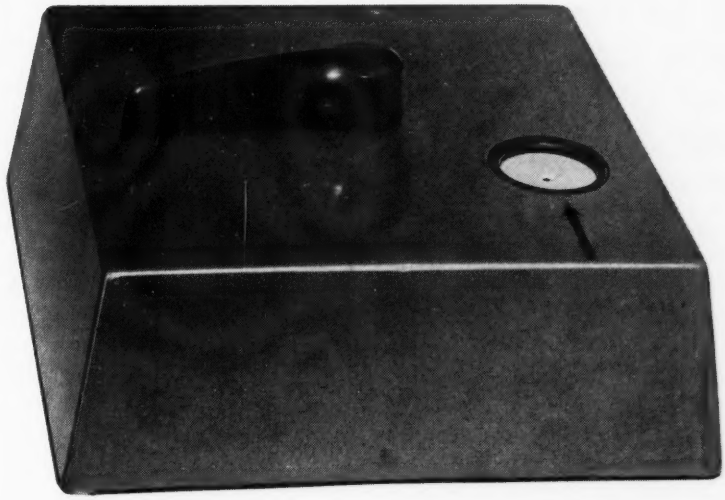

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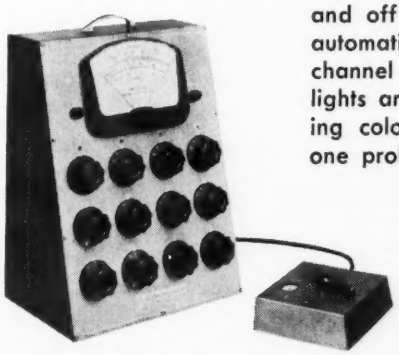

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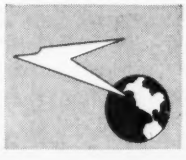

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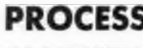

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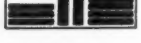

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PHOTOGRAPHER IN INDUSTRY:

Missile Photographer

The chances are that when you see a photograph from the Air Force Missile Training Center at Cape Canaveral, it was taken by Charles "Chuck" Rogers. He is the only person authorized to shoot missile photos for release to the press by the AFMTC.

But don't get the wrong impression. Rogers hasn't become one of the most published photographers in the world while still in his twenties because of any monopoly. His color and black-and-white pictures have appeared on the covers and inside dozens of magazines and newspapers both in this country and Europe because he has a knack for capturing all the drama inherent in a missile.

Chuck, a native Floridian, started shooting missiles full-time in 1957, after garnering experience in press and studio photography. Since then, he estimates he has made more than 10,000 pictures.

The first thing Rogers does on arrival at the pad on the day of a launch is set up the Air Force K-24 cameras which will be operated remotely and will record the launch at a rate of three frames per second. These cameras provide very close-in coverage of the launch. After these cameras are operational, he starts to plan his coverage of the pre-launch activity. This coverage is usually photographed with a Speed Graphic. If he's restricted to using a tripod-type camera, he chooses an 8x10 Deardorff.

Pre-Launch Activity

During pre-launch activity, he first tries to fulfill the basic requirement of documentary photos of the missile. After this requirement is satisfied, he then looks for shots that might be a little different, such as showing the technicians readying the missiles.

On daylight shoots exposures range from 1/500 at *f*/8 on the color sequence cameras on the pad to 1/800 at *f*/11 on the black-and-white camera at the tracking site, which is usually outside the danger zone (approximately 2000 to 3500 feet, depending on the missile type).

After completing pre-launch coverage on the pad, Rogers makes a final check of the operational status of the remotely operated cameras, sets exposures and clears the area. Exposure estimating for these remote cameras is sometimes difficult because occasionally the shoot is scheduled for a time of day when the light changes rapidly (dusk or dawn) and a hold for 15 minutes could mean the difference in the amount of light as much as 200 per cent. Sometimes Rogers is set up for a daylight shoot that holds into darkness. Other times he has been set up for dark days when there was no sun only to have a spot of direct sunlight shine on the pad about five minutes before T-time. Under exposure can be compensated for, but over exposure results in loss of good coverage.

Rogers then sets up his "long guns" at the tracking site. There he uses a Graflex with a 1000-mm *f*/8 lens.

On night shoots, the pad's remotely-operated color cameras are exposed 1/150 at *f*/2.5 and black-and-white at 1/150 at *f*/4. The black-and-white tracking camera is exposed at 1/125 at *f*/8 on Tri-X.

About his job, Chuck Rogers says, "Missile photography, like missiles themselves, is still in its infancy. On each missile, I learn something new. I wouldn't trade my job for anything."

About Chuck Rogers, famed aviation writer Martin Caidin says, "he is a poet with a camera." □

continued from page 50

in this manner, the film was reversed. When shown on the screen it gives the effect of a line growing around the earth's sphere in the exact path of the capsule's orbit.

3. ***Cell-by-cell animation** was used in such scenes as a rocket rising from blast-off. A separate cell was used for each change of position and to show diminishing size of the rocket as it went up.*
4. ***Gadget technique** was employed in a scene of the astronaut in the capsule viewing the earth through his periscope. A slide map of the U.S. was moved across the viewing screen on the artwork to show the capsule's passage over the country.*

A typical scene in the picture is the reentry of the capsule into the earth's atmosphere. In this situation the capsule gradually heats up. To film it with cell-by-cell animation would have required over 200 separate cells. But, by experimenting, an approach was devised which required only 12 different cells.

The major problem here, in showing the heat-up, was that the film had to be backed-up and re-exposed. In doing this the stars on the space background were apt to overlap and blur. To prevent this and reduce the number of cells needed, the entire sequence was shot with a black mask silhouette of the capsule located at zero for perfect register. The background was moved a 200th of an inch per frame for a total of 1680 frames. This gave the desired movement with the capsule outlined in black.

Next Step

The next step was to insert the detailed capsule art work and show it gradually heating up as reentry took place. This was accomplished by backing up the 1680 exposed frames to the exact starting point. The black mask silhouette was removed and the detailed capsule cell was put in its

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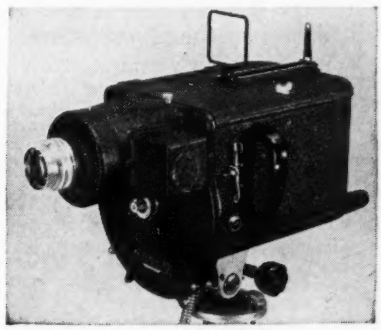

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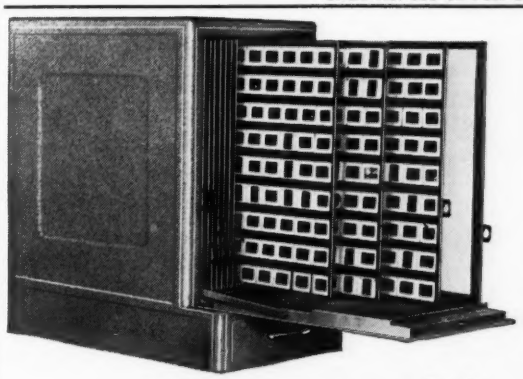

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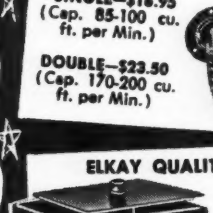

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place over a black background with two clear acetate cells on top of the capsule. The two clear cells were needed because there would be two heat-up cells placed over the capsule in the sequence and without the clear cells the density of the final product would be incorrect. Two hundred frames of this were then reexposed using the same movements as before.

Faded Out

Then the capsule was faded out completely, the clear cells removed, and the first orange-tinted heat cell and one clear cell added. The scene was then faded in completely and 50 more frames reexposed.

Dissolves were accomplished by stopping the shutter down for 14 frames, adding the cells, backing up, and opening the shutter on those frames until the scene was completely faded in. This procedure was followed for all seven heat cells involved in the basic heat sequence (or until the heat shield at the blunt end of the capsule glowed red, as it will during reentry).

Then the second clear cell was removed and another heat cell, showing the body of the capsule beginning to redden and emit vapor, was added over the basic heat cell. Cycling two heat cells, identical except for vapor trails, gave movement to the vapor. The same dissolve as before was followed and the film (the last of the 1680 frames) was allowed to run out.

Settings Recorded

All art table settings, north-south and east-west movements, were recorded in case any scene had to be reshot. In this way, any errors could be quickly detected and corrected. Also, any unusual effects involved were carefully noted down.

For example, in the pitch reaction control sequence, the amount of movement of the capsule was ¼ of a degree per frame, and it was moved on the background at 1/100 of an inch at the same time. It was determined that this was the standard rate of movement where space was the background. This scene shows the astronaut activating hydrogen gas jets by turning hand levers affixed to his chair to position the capsule after it has been turned by booster rockets to a position of blunt and forward (orbital attitude).

Motion picture section personnel were uncertain as to the exact amount of hand-movement involved. So, they seated a pilot in a similar position and exposed some black and white footage of him performing this operation. These frames were then counted for length of time involved, and studied to determine the number and degree of moves per frame and their relative angle.

To have filmed this with cell-by-cell animation would have required over a thousand individual art cells. The McDonnell art department devised a method to cut this to just one cell.

Here's How

In the art work the arm of the astronaut is somewhat shaded. The hand is affixed to pivot with a section of acetate on the backside extending to the bottom of the art work and marked off with the degrees to be moved in each frame. This scene involves cutting from the astronaut activating the hydrogen gas jets, to the capsule rotating from the force of the jet. In filming this sequence the special ring was used to move the animation cell independently of the background on the art table. This allowed the capsule to be turned laterally (¼ of a degree each frame) while the background remained static, and saved over 360 separate cells.

Other problems were solved with equally ingenious solutions. One was reproducing the gradual increase and decrease of speed of the capsule in space. To do this, the teeth on the gears of the animation table were first counted. Full speed of some objects crossing the table was found to involve

seven teeth on the animation gear. To begin a speed-up, the object was moved one tooth per frame, then two teeth, and so on until the full seven teeth per frame were reached. Deceleration was handled the same way.

Similarly, the speed of some objects was determined to be 14 teeth per frame on the gear. Speed-up began at two teeth, then four, then six, until full speed was reached at 14 teeth per frame.

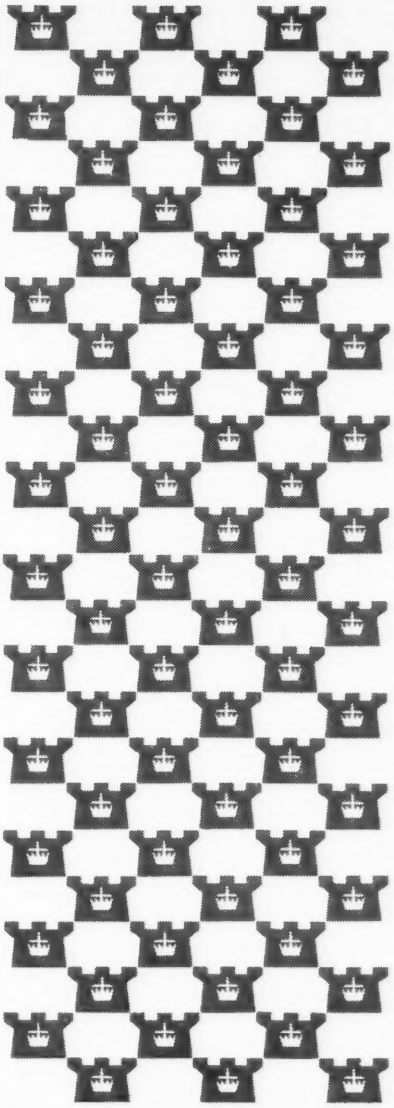
In another unusual situation with an equally unusual solution, the pitch reaction control sequence shows the positioning of the capsule. When the first gas jet goes on, it flames for 28 frames, or about one second of screen-time. There is a speedup as the capsule moves ¼ of a degree. It was decided that to stop the capsule's rotation one half as much force would be needed. So, the second gas jet is shown for 12 frames or about ½ second of screen-time.

Next, the film was run for 10 frames without any move. Then the third gas jet was activated for 10 additional frames. This represented the achievement of complete adjustment and the capsule was then stable at 35 degrees and the scene continued for 100 frames more.

Putting together the Mercury Capsule film was only one of 28 color film projects completed by the McDonnell motion picture section in 1960. Other activities include report, training, engineering and test-record films as well as thousands of feet of bulk, unedited color-film reports for NASA; all work is in color on either Eastman Ektachrome Commercial film or Eastman Ektachrome ER film.

More Animated Films

McDonnell scientists, happy with the results of their moviemakers, note that as they move more and more into the arena of space they will turn more and more to animated films for graphic previews of things to come. Based on their experience to date they will do it with confidence. □



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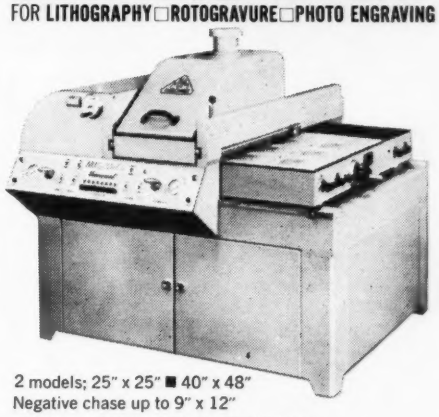

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ROUNDTABLE

continued from page 19

Here's another way to act like company men and sell photo service at the same time:

When you see or hear of a process or piece of equipment that you feel sure will save time and money (and time is money), take it up with the department which might benefit. But be sure that your facts and figures are couched in the department's terms, not hypothetical terms.

Here's an example. At Allis-Chalmers the employment office was using an old I.D. camera to photograph personnel, often missing on the exposure. Rolls were sent to photo for processing. The suggestion made to employment was: It'll take less time and will insure getting every photo you want if you use a Land camera. You won't have to wait for prints from photo and you'll eliminate the time-consuming task of sorting out the prints. If you miss an exposure, your technician will know and be able to make another while the subject is in the office.

Time is Money

Employment is getting the good service it needs and it is appreciative for photo's advice, which was given in terms employment understood. Photo, incidentally, saves time by not having to process the rolls and make prints. And time is money, remember.

There are a great many areas in which an industrial photo department can help out, save money, save time, and deliver a better job than previously possible. Here's one.

A short while back Allis-Chalmers Plant Engineering department brought this problem to photo. In an attempt to increase efficiency in the foundry, it seemed expedient to add more pieces to existing copes. At first it appeared to be a mountainous project involving the making of thousands of drawings and blue prints. Photo solved the problem by photographing all the existing copes on 35mm film, and then making enlargements up to the correct size.

When this was done, it was only necessary to take the additional pieces and place them on the finished photograph. This was done at a materials cost of $12.

This department previously considered photo a nuisance that it was forced to put up with. Now, like many other departments not normally engaged in large scale use of photographs in more standard ways, it thinks of photo first when a problem of illustration or reproduction comes up. That's helping people solve their problems. And it contributes to the functions of management in providing the most desirable facilities at the most practical cost.

Don't just regard a project as a one-shot deal. While you're setting it up to solve the problem at hand, also look into the possibility of creating further demand. In other words, get out and merchandise your project into becoming a new service. Develop information which will help make the project appealing and practical to as many people as you can reach. But keep top management in mind: The project must really solve problems and help people make or save money.

The point to put over in establishing new projects like these is to emphasize first that a problem is being solved. That it is being solved at minimum cost. That it also opens the door to solving certain other problems which are part of day-to-day operations of whatever departments are involved. That it can be made a permanent feature of photo operations with only a minimum of equipment. And friends, the last point had better be made last.

Management at first wants to see that its photographers can do a workmanlike job with what's available, rather than hear about the big job photo's going to do if somebody will please pick up the tab. □

MICROFILM GLOSSARY

continued from page 69

projecting the images of opaque or transparent objects upon a screen.

Facsimile — A hard-copy reproduction.

Fast — A relative term given to the speed of emulsion.

Film, Master — That film from the first microfilming of a document.

Film Mottle — Cloudy or blotchy appearance, uneven density generally caused by insufficient agitation.

Fog — Produced in a sensitive emulsion by any chemical means. Often caused by a very energetic or contaminated developer.

Gamma — A numerical expression of development contrast or degree of development.

Gate — The area or component in which the film is held at a fixed relationship to a lens.

Generation — The photographic reproduction made from an original or another reproduction.

Hardener — A chemical which makes the gelatin of the emulsion insoluble and prevents softening.

Iris — A circular mechanical device which controls the amount of light reaching the lens.

Isometric — Indicating or maintaining the same proportions, measures, dimensions, etc.

Jacket (Acetate) — Special construction of transparent plastic to hold microfilm strips.

Kalfax — An emulsion sensitive to UV light coated on a Mylar base and processed by heat.

Line per MM — Pertaining to resolution, the number of light and dark line pairs contained with 1mm length.

Microfiche — A large sheet of microfilm with rows of small unitized images.

Microfilmer (Planetary) — A microfilming device in which the document is held in a plane and both the document and film are stationary during exposure.

Microfilmer (Rotary) — A microfilming device in which the document is exposed through a slot and both the document and the film are in motion during exposure.

Microphotograph — A microscopically small photograph, one requiring magnification to be readable.

Microprint — "Micro" images of graphic information on an opaque sheet. Often referred to as micro-opaques.

Photomicrograph: A photograph of a minute object made with a camera and microscope.

Pull Down — The amount of sensitized material advanced after each exposure.

Resolution Chart — A device to test resolving power. Usually alternate black-and-white lines of equal width arranged in groups of decreasing line width, identified as the number of line pairs per millimeter.

Rewind — A device for winding film from one spool or reel onto another.

Microfilm Dealers

For the location of the microfilm service company nearest to you see the handy directory on page 69.

Sharpness — The degree of clarity.

Shelf Life — The limited time any sensitized material can be stored and remain usable.

Step Wedge — A series of tones in steps from white to black usually on film or a glass plate for testing purposes.

Stock Solution — A concentrated solution which is to be diluted with water for use.

Trimmed — Accurately cut or sliced down to a desired size.

Tungsten Rating — A speed value assigned to photo-sensitive materials to indicate their relative sensitivity to light produced by tungsten filament lamps.

View Printer — A reader with built-in facilities to expose and process enlargements.

Viewer (Hand) — An optical magnifying device for hand use.

Xerography — A dry, physical process of photography in which an electrically charged latent image is developed by an oppositely charged dry powder. □

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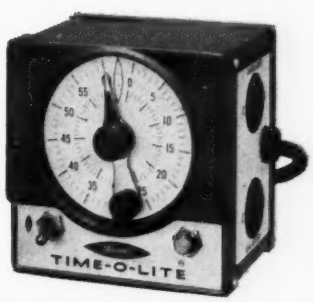

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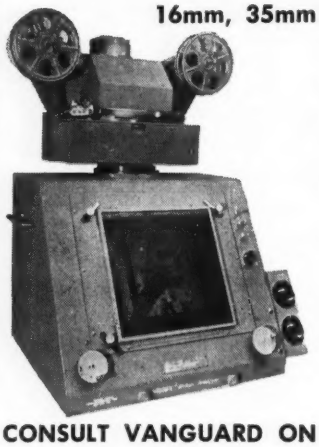

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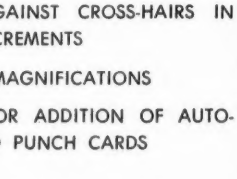

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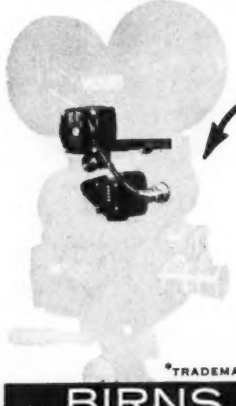

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NEW PRODUCTS

continued from page 73

DC has been designed for operation of a variety of motion picture and sequence cameras, tape recorders and data recording instruments. Called the Dynamax Power Pack, the unit may be recharged repeatedly through a companion unit which operates on 115 volts AC. It is available with 12- or 24-volt outputs and also a model for the Arriflex which supplies either 8.5 volts or 17 volts. The complete Power Pack is housed in a leather case for over-the-shoulder use.

Slide Projector 120

Bausch & Lomb has recently introduced its Balomatic 655 slide projector with a zoom lens. The new lens permits up to 175% change in projection distance or picture size. The focal length is continuously variable from 3¾" to 6½" and neatly telescopes to fit with the projector into the standard case. Other features of the model 655 are one button forward and reverse operation from projector or remote cord, non-spill trays, instant editing without tray removal and anti-slide-popping. Price: $149.50.

Automatic Copier 121

A unique, fully automatic copying machine is now being marketed by a a group of companies including *Anken Chemical and Film Corp.*, the *Ozalid Div.* of General Aniline and Film Corp. and *Photek Inc.* The machine will copy any kind of original up to 11" wide and lengths up to 150'. It automatically turns itself on when the original is fed into it, makes the exposure, adjusts itself to the length of the original, trims the positive and produces prints at the rate of four per minute. Copies are permanent and dry flat. The machine which weighs 65 lbs., is designed for table top use and is cased in a molded polystyrene housing. Since rolls of positive and negative material are used, no paper safes are required, and visual and audible signals are provided to warn the operator when the unit is empty.

Safety Lights 122

A lamphead specifically designed for use in hazardous environments has been produced by *Natural Lighting Corp.* Originally produced for recording missile launches on closed circuit TV, the new ColorTran Explosion-Proof Light LCKS/64WP uses the Par 64 lamp in conjunction with ColorTran converters to give light equivalent to a 5000-watt lamp, but at one-quarter of the amperage. Measuring 10", the 12-lb. light is recommended for industrial as well as military applications wherever portable, safe and efficient lighting in dangerous test areas is required. Price: $120.

Microfilm Printer 123

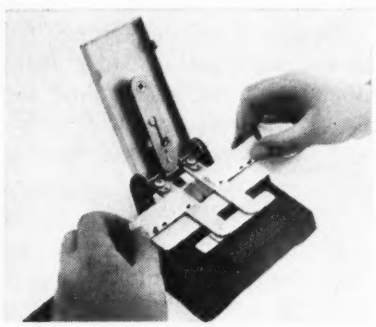
A continuous 35mm contact printer for microfilm has been introduced by the *Uhler Cine Machine Co.* Designed for unperforated films, the unit features a rotating printing drum to eliminate scratches on the negative, a gear drive for extra long wear and a rheostat operated light density control. Three flanges and one magazine are supplied for 1200′ rolls of negative, positive or duplicating films. Speed of the unit is 1600′ per hour.

Carbon Sheets 124

Allied Carbon & Ribbon Mfg. Corp., has developed a complete line of orange diazo carbon sheets for backing up originals to be reproduced on Ozalid, Bruning and other Diazo type machines. These sheets are available in 7, 15 and 25-lb. weights in formulas that are said to produce rich, sharp diazo copies on backgrounds that are completely free from typewriter feed-roll shadow. A special opaque quality is said to reduce exposure time.

Film Splicer 125

A distinctive E-Z curved tape splice is the distinctive feature of the new Model 8-16B E-Z film splicer offered



by *Bayliss & Whiteside*, distributors of the Rowe Line products. The splicer accommodates film in different and shrunken conditions and is designed for use with E-Z tabs. When used as a tape splicer it offers a splice that ends on the frame line and has a curved cut, two features designed to minimize interference with the picture area. Price: $39.95; tabs, $1.75 per 120.

Micro-Slide Projector 126

A novel projector attachment for showing standard 1″ x 3″ microscope slides to large groups has been announced by *Elgeet Optical Co. Inc.* Called the Elgeet Zoom Microtar Attachment, the unit is designed to fit most standard 35mm projectors and also gives a continuously variable magnification. The *f*/1.5 lens is also equipped with a field size controlling diaphragm and is ventilated to prevent heat damage to specimens. Price: $64.50.

High Speed Camera 127

Benson-Lehner has announced production of a high speed stereoscopic camera. Aside from the uniqueness of its 3-D recording, the Stereoflex camera is also claimed to be the fastest accelerating camera ever built and its 35mm film reaches a speed of 127 mph in less than one second from a standing start. A steady synchronous speed is maintained thereafter. The rotary prism camera is balanced to within 37 millionths of an inch to eliminate vibration and will expand a one second event to a full minute of viewing.

Data Storage System 128

In an effort to simplify the storage and retrieval of valuable information, *FMA Inc.* has developed a new machine which can automatically search a 32,000 page file and present the desired information in five minutes. The FMA FileSearch system is basically composed of a recording and retrieval unit which converts ordinary material such as magazine pages onto microfilm with descriptions of the contents consisting of coded dots. Requests for information are fed to the machine on punched cards. Up to six requests may be fed simultaneously. When the desired page has been found, the operator has the option of delivery of hard copy or viewing only. The complete system excluding a recording camera and simple indexing machine measures 71 x 55 x 50 inches.

Diazo Papers 129

A wide variety of tinted sensitive papers are now available for both *Ozalid* dry and Ozafax semi-dry processes. The dry papers are made in blue, pink, green, and yellow stocks with blue, black or red images. Paper for the moist developing machines comes in blue, green, pink salmon, buff and yellow with black images. Both series are made in various speeds and are claimed to have superior shelf life.

Swiss View Cameras 130

The availability of a complete line of precision-made view cameras which carry the Acra-Swiss brand name has been announced by *Standard Camera Corp.* There are five models in the line: 2¼ x 3¼; two 4 x 5 models; 5 x 7; and an 8 x 10: Prices: $225-643.

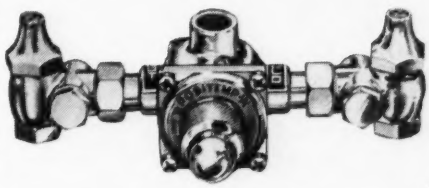
Professional Film Package 131

Anscochrome and Super Hypan roll films are now offered in 25-roll professional packages by *Ansco.* Each package contains 50 rolls of the same emulsion number and the box may be used as a shipping carton. It is available in 120 (foil-wrapped) rolls and 35mm aluminum cans.

NEW, IMPROVED

BAR-RAY*

MIXING VALVE



The New BAR-RAY POSITEMP "A" . . . a major advancement in temperature control valves . . . guarantees extreme accuracy regardless of wide temperature and pressure variations.

The New BAR-RAY POSITEMP "A" automatically delivers water at plus or minus 1° Fahrenheit with pressure differences as great as 30 lbs. Temperature range is adjustable in the field from 50° to 110°.

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The New BAR-RAY Thermostatic Control Valve

This variable temperature valve (#1109) consists of a mixing chamber, vacuum breaker, shut-off valve and dial thermometer . . . and is adjustable from 40° to 140° F by the turn of a handle.

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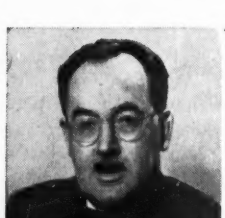

sipley on patents

DR. LOUIS W. SIPLEY

Director, American Museum of Photography

A recent decision by the United States Supreme Court in a patent case, although not centered on a photographic patent, may prove of more than ordinary interest to our readers.

The case in question centered around a suit brought against a firm manufacturing replaceable fabric tops for use with automobile tops manufactured under a patent issued under the name of "Convertible Folding Top with Automatic Seal at Rear Quarter."

Elements Patented

In the patent as granted, only the *combination* of the elements used was patented; the individual elements used to make up the finished product were not patented. However, the owner of the patent rights brought suit against a firm manufacturing fabric shaped to fit such convertible tops and selling them to individuals to be installed in place of the worn-out original fabric.

The center of argument in this case was whether the purchase and installation of such a fabric top to replace a worn-out original top constituted a *reconstruction* or a *repair*. According to patent law precedents a reconstruction is considered to be the same as producing a new device of the type covered by a patent. However, in repair, the individual is considered as keeping the patented device, which he has purchased and which is his property, in operable condition. Where the parts used for such repair are not in themselves a patented item, the courts have generally held that the use of such repair parts purchased from any source and not necessarily made by the owner or licensee of such patent does not constitute an infringement.

In this case, however, the United States Court of Appeals came to the decision that the fabric was not "a minor or relatively inexpensive component" of the patented combination, and that although its "expectable life span" was shorter than the other components in the combination, its cost was such that it could not be considered by the owner as a "minor repair." The respondent—the name given to the party bringing suit—claimed that since the fabric formed an essential part of the combination and that the particular shape given the fabric formed the "heart" of the invention, he was entitled to a monopoly on the fabric. The Court of Appeals ruled that the manufacture of such fabric and its use on the patented combination constituted an infringement.

Decision Reversed

However, when taken to the U.S. Supreme Court, this decision was reversed. In delivering the opinion of the Court, Justice Whitaker said: "No element, not itself separately patented, that constitutes one of the elements of a combination patent is entitled to patent monopoly however essential it may be to the patented combination and no matter how costly or difficult replacement may be." One of the other facts pointed out by Justice Whitaker was that a "license to use a patented combination includes that right to preserve its fitness for use so far as it may be affected by wear or breakage."

Considering the multiplicity of parts on many photographic devices, it is not difficult to imagine a parallel case centered around a piece of photographic apparatus instead of an automobile top. □

SHOPTALK

continued from page 21

jobs or job titles include Robert Scott, formerly manager of film communications at Douglas Aircraft who is now Associate Director, Government Relations, A-V requirements, Aersospace Corp. The new manager of Film Communications at Douglas is Bill Gibson, who heads all still and movie work.

Photog Cops Award

BENDIX GENERAL MANAGER Milo F. McCammon (C) congratulates Peter A. Carey after the latter was honored by the Industrial Photographers Association of America with a gold plaque for his outstanding contributions to the field. Carey heads the photo section at the Eclipse-Pioneer Div. of Bendix at Teterboro, N.J. Also shown is C. C. Shangraw (R), Bendix executive engineer.

● *Fast-moving industrial photographers in recent days have included our (and Western Electric's) Morris Gordon who has co-chaired the University of Miami's annual photojournalism conference and visited Poland and the Soviet Union on a speaking tour . . . Ted Williams, Western Electric; Jack Leuddeke, Bell Labs; Jack Gabrielson, Walt Tufts and Dick Backus, Douglas, all of whom went to Kwajalein Island to record Nike-Zeus test activities.*

● Dr. Louis W. Sipley, head of the American Museum of Photography and whose column on patents appears monthly in IP, was awarded a gold medal for his historical contributions to photography and photomechanical reproduction by the Photographische Gessellschaft of Vienna. The award was made at the 100th anniversary celebration of the Gessellschaft in May . . . also in Europe the Institute of British Photographers celebrated its diamond jubilee.

● A comprehensive listing of upcoming dates to remember will be found in the IP calendar, page 20. But for your immediate and special attention we would like to cite the following: Kent State University's short course in photojournalism, June 13-16 at Kent, Ohio. . . . Professional Photographers of California Western States Convention, July 6-10, Long Beach, Calif. . . . 21st Annual NAVA Convention, July 22-25, Chicago. . . The 8th National Industrial Photographic Conference, July 30-August 4, New York. . . . 31st annual meeting of the Biological Photographic Association, August 21-24, Chicago . . . 1961 University Film Producers Conference, August 21-25, Berkley, Calif. . . . Photo journalism conference in the West, 1961, Sept. 26-29, Asilomar, California.

● *Miscellany: Thirteen papers delivered at a symposium devoted exclusively to sound recording and reproduction as used in motion pictures and related areas are now available for general distribution.*

A complete list of the papers is available from Behrend Cine Corp., 161 E. Grand Avenue, Chicago, Ill., sponsors of the symposium.

Help to Police

WALTER BACH (L), president of Bach Auricon, Inc., receives an award plaque from Ken Jordan (R), *Law and Order* magazine, for helping to prepare the most helpful police equipment article to appear in the magazine in 1960. Center is Bob Boone, author of the award-winning article, "Using Sound Movies in Police Work."

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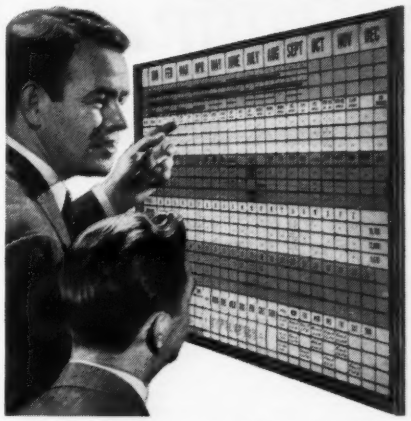

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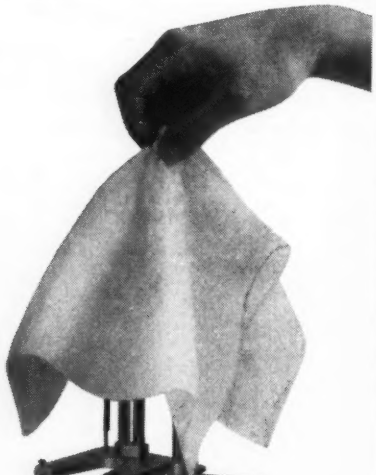

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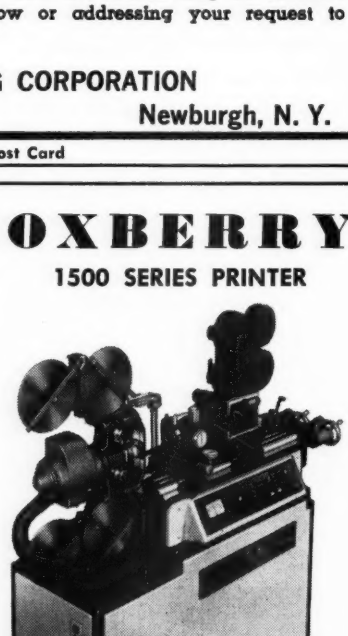

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MARTIN

continued from page 45

first discovered on films of the tests.

While slowing down the motion of a missile headed for outer space at high speed is not easy, recording an exploding bolt on movie film is even harder. The bolts or similar holding devices separate the missile from its umbilical lines which feed it fuels and initial power and also separate one stage from another in outer space.

To do the job the photo section uses a slow motion camera which can expose 100 feet of film at a rate of 8400 frames per second. The film is like ordinary 16mm stock except for its emulsion and special sprocket holes. Engineers can watch the film on an ordinary or stop motion projector.

Cameras in the Lab

Many times Martin photographers are needed in the lab to make color motion pictures of materials subjected to extreme heat. Films provide a check against other mechanical means of determining temperature. Since they experiment with many combinations of filters, emulsions and development methods before they get accurate reproduction it is understandable that about 10,000 feet of movie film is used each month.

Creep-strain tests of a metal specimen tax the ingenuity of the cameramen. Here a tiny specimen is mounted on a platinum slide-rule-type gauge where it is subjected to stress and heating in a controlled furnace.

Photographers use a bank of solenoid-controlled movie cameras which can be set to expose an individual frame at an interval of as long as once every ten hours. Thus the material's slow breakdown (which often lasts for days) is recorded.

A special lens arrangement magnifies the subject up to 40 times, with light provided by a five-watt electric bulb. Special

developing raises the ASA rating of the fine grain film to 2,000.

The application of photography is vital in the study of plasma jet engines where the camera records thrust. Thrust is created by ionization of metal through the use of a very high electrical charge. The blast is of very short duration and produces a small amount of thrust, thus it is being studied for use in outer space as a steering or small thrust rocket.

In a darkened room the lens is opened and pointed at a tiny copper cup which is suspended behind the test engine. The flash from the engine provides the light to photograph the cup swinging back along a scale which indicates the thrust produced.

A photographer taking a news photo of the blast inadvertently solved an electrical problem engineers had been having with the equipment. His photo revealed a short circuit in the wiring which was too brief for the eye to note in the blinding light of the plasma stream.

Camera Supplants Clock

Another application for Martin's ubiquitous cameras is as a tool for recording time in research projects. Because an event studied often starts and ends in a split second the engineer has no way of determining when individual things take place except through the use of a camera.

In high speed movie filming a tiny light inside the camera controlled by a 60-cycle electric current blinks every .00833 of a second, exposing the edge of the film. Scientists thus can determine to the fraction of a second when each frame on the film was exposed.

Although it does not produce a recognizable photograph a camera is used to record the length of time of very rapid explosions. Light from the explosion goes through the lens of the camera to a mirror rotating up to 10,000 RPM. The reflected light makes a streak on a curved film

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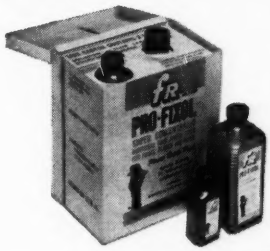

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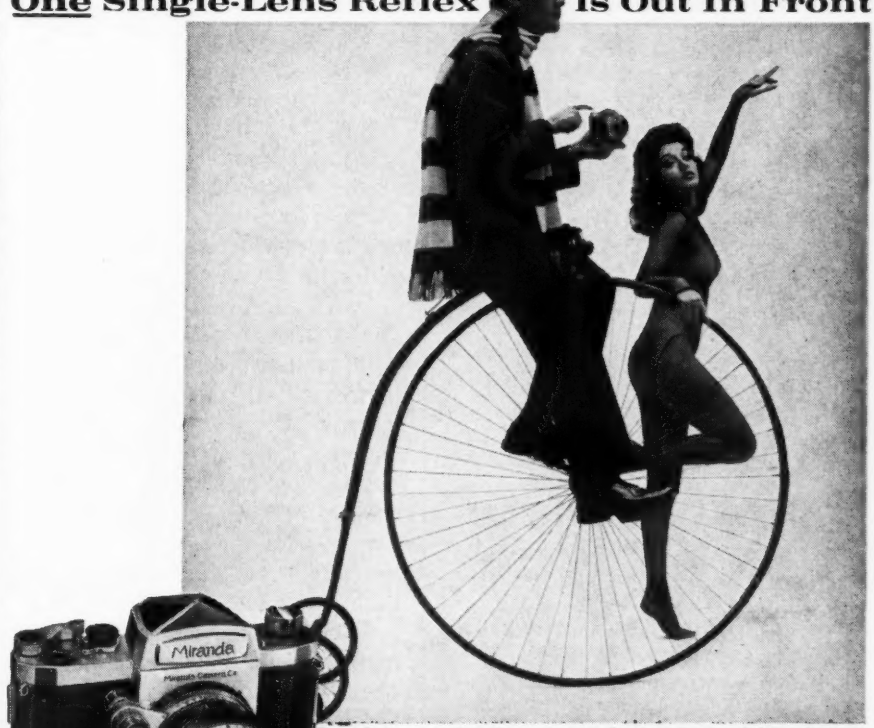

Imagine a true luxury camera priced to fit the tightest budget . . . Miranda-Soligor f1.9 fully Automatic lens interchangeable with most other 35mm lenses; instant-return mirror; eye-level pentaprism viewing; synch. shutter to 1/500th second; rapid film advance and rewind and lots more! See how much more you get for a mere **$159.95** Maximum Retail Price. 'D' with f2.8 preset lens **$119.95** Max. Retail Price.

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at the back of the camera. When the rate of revolution of the mirror and length of the streak on the film are known, the time of the explosion can be determined to the extreme accuracy needed in certain tests.

Drawing Miniaturization

Currently a new technique is being perfected for reducing a giant-sized engineering drawing, which might cover the tops of two or more desks, into a tiny electrical cryogenic circuit which is designed to operate at—454F!

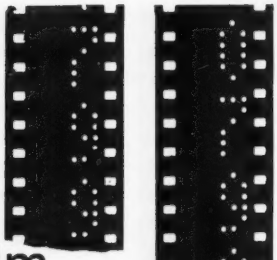
Since 600X reduction is often required, the lines in the finished product require a microscope before they can be seen — and they must be as sharp and clear as in the original.

The work is done in a room with a movable board on which the drawing is placed. The exposure is taken through lenses up to 35 inches with a high resolution plate using a special emulsion. To reach the required reduction the subject is photographed twice. The final developing is done under controlled conditions.

A thin brass sheet, coated with an emulsion, is then exposed, using a positive film. It is then acid-treated until the fine lines of the electronic circuit are cut through the sheet. The final circuit is reproduced by evaporating metal in a vacuum through the holes in the brass sheet to produce extremely fine plating.

Of course, not all photography performed at the missile company is of an equally technical nature. Stills of captive firings, records of production, illustrations for training manuals and news photos are also included in the duties of photo sections at each division.

Each day it becomes increasingly evident that the photographer will be a key member of space teams from now on. When man begins to explore space on a regular basis it's a pretty good bet that space photography will be just as important a specialty as space systems photography is at Martin today. □



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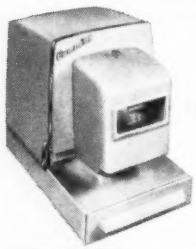

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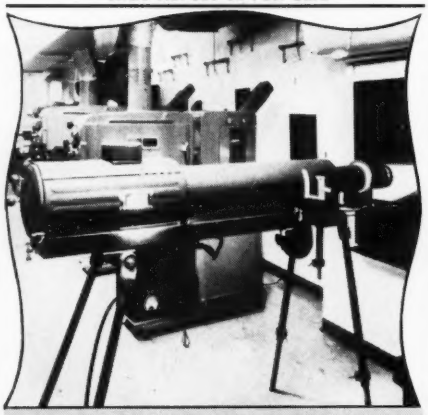

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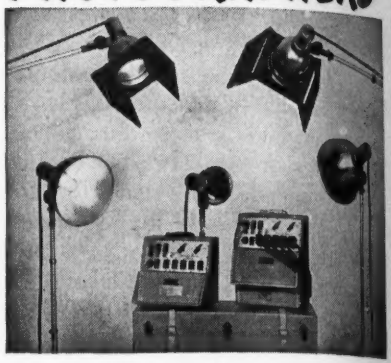

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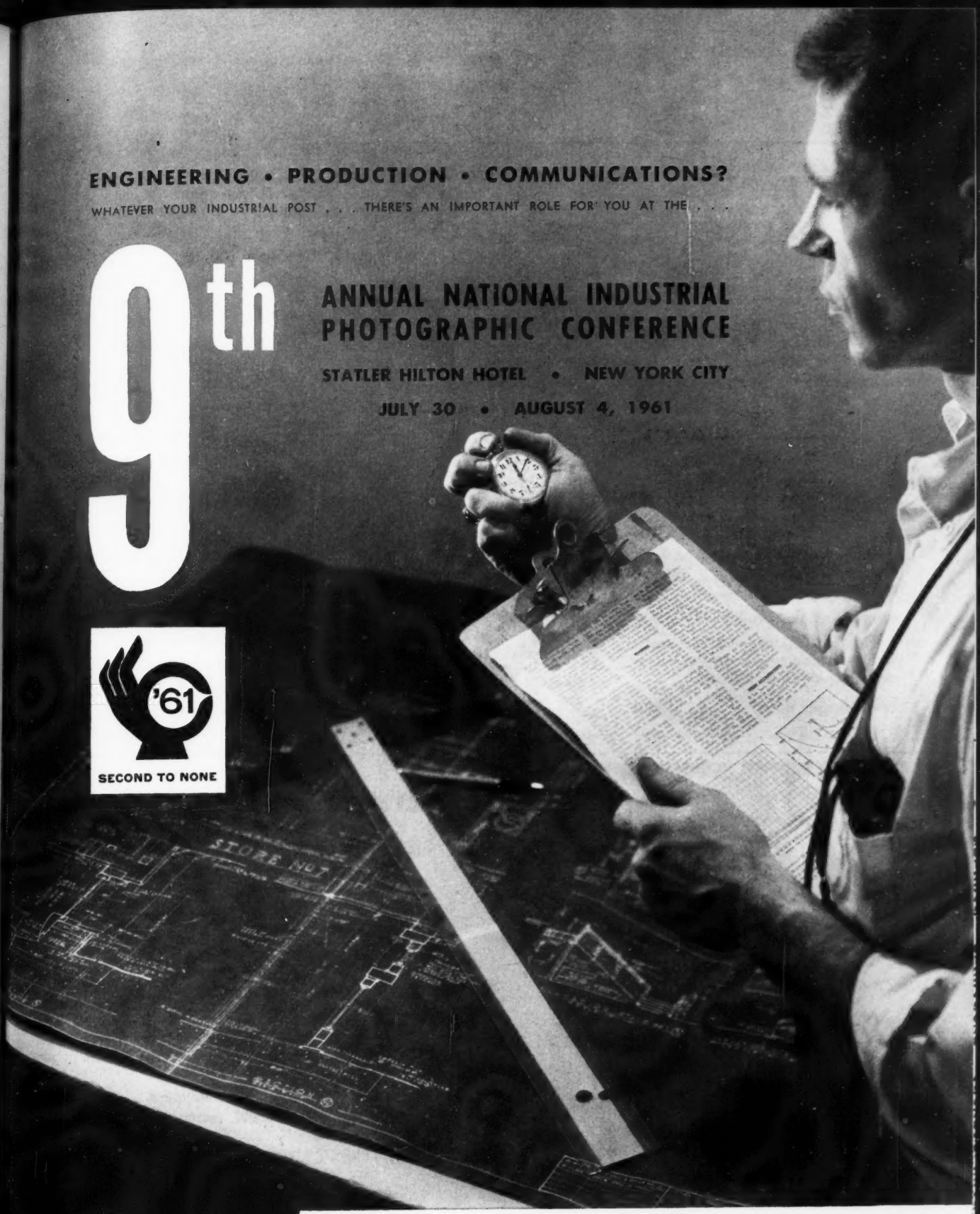
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new free literature

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CAMERAS, LENSES, ACCESSORIES

Photar Filter Glass **203**

Tiffen Optical Co. 40-page book simplifies the selection and application of filters.

35mm Reflex Camera **204**

Yashica. Info on new Pentamatic with interchangeable lenses, automatic stop-down diaphragm.

Wide-Angle Rollei **205**

Burleigh Brooks. Data on new wide-angle Rolleiflex incorporating built-in *f*/4 55mm Zeiss Distagon lens.

10-Second Slide Film **201**

Polaroid. Info on new film for Standard Polaroid Land camera which makes high contrast slides with sharp clean lines.

New Model SLR **202**

Eastman Kodak. Data on a revised model of the Retina Reflex (Model III) featuring a two-way automatic exposure control system.

Correct Exposure **206**

Kling Photo. Color brochure showing the procedure for correct exposures with the lightweight (1½ oz.) Gossen Pilot meter.

Bargain Catalog **207**

Edmund Scientific Co. Catalog AA (128 pp.) shows lenses, war surplus optical instruments, prisms.

Film Holders and Repairs **208**

Hoffman Professional Camera Company. Brochure on film holders and repairs, bellows and slides.

Lens Accessories **209**

Tiffen Optical Co. 64-page Quick Reference Directory includes neutral density filters, close-up lenses, etc.

DARKROOM SUPPLIES, EQUIPMENT, X-RAY

Printing Papers **210**

Ilford Inc. Flyer on various papers available including Ilford Multigrade.

Spotting Colors **211**

Webster Bros. Brochure about in-

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visible spotting colors plus free color chart.

Filtration Units 212

Heico, Inc. Booklet describes filtration equipment for photographic processing waters.

Photo Products 213

Elkay Photo Products. Literature on darkroom ventilators, tanks, and other photo products.

Film Proofer 214

Hudson Photographic Industries. Data on film proofer which allows entire roll of film to be printed on one 8 x 10 sheet.

Table Model Dryer 215

Simplex Specialty Co. Details on a table model dryer for quality and quantity production.

Film Cleaning 216

Nicholson. Flyers on suggested method for cleaning film faster and more effectively plus protecting film with Tuff Coat.

Color Equipment 217

Bernalen. Data on color equipment for type "C" and all color processing.

Spray Processor 218

Hi-Speed Equipment. Info about the new FA-50, a compact spray developing machine for 16/35mm film.

VIEWERS, PROJECTORS, SCREENS, SLIDES

Animating Slides 219

Technical Animations. Data on technique of animating ordinary 35-mm slides by originators of Technamation process.

Standardized Lighting 220

Macbeth Corp. Eight-page brochure on Avlite Viewing Equipment, now modified for transparencies or reflection copy.

Protectors 221

Kimac. Free sample of skin-tight Kodapak sleeve which fits all viewers and projectors.

Slide Cabinets 222

Multiplex. Brochure on all-steel slide cabinets which have the right kind of visible filing space.

Superwide Lens 223

Buhl Optical Co. Details on superwide lens which cuts throw to a third of usual distance.

INSTRUMENTATION

High Speed Photography 224

Wollensak. Latest brochure on Fastax High-Speed Cameras.

Instrumentation Equipment 225

Camera Equipment. Catalog includes instrumentation equipment for your selection.

Research Instruments 226

Photomechanisms, Inc. Data on rapid film processing cameras, automatic titling equipment and other items for industrial and scientific use.

High Speed Films 227

DuPont. 19-page booklet entitled "DuPont Cronar Base Films For Photo Instrumentation".

Data Reduction 228

Data Services. Lit on services in precision film, oscillograph reading, flight analysis and other photo-instrumentation areas.

CINEMATOGRAPHY

Precision Dubber 230

Pictronics Corp. Data and specifications available for the new Magnasync Mark II portable Dubber.

Duplication Charts 231

Movielab. Two-step charts indicate methods for duplicating negative and positive color and show relative advantages of each.

Color Stock Library 232

Lem Bailey Productions. Info on a 16mm color film library and new service department for industrial, training, sales, and promotional films.

Special Services 233

Acme Film. Data on motion picture lab offering all standard lab services plus Videotape duplicating and transfer to film.

Editing Charts 234

Hollywood Film Enterprises. Brochures on proper editing of A & B rolls and on the lab procedures for 16mm film.

Tewe Directors' Finders 235

Birns & Sawyer. Six-page brochure lists all various optical zoom finders including the Model K which zooms in from 8mm wide-angle to 75mm medium telephoto.

Gator Grip Light 236

Beckett & Leonetti. Quality socket with switch, cord grip and 20 ft. #16 extension cord and standard plug.

Processor 237

Oscar Fisher Co. Data on the Autotrac Processall, an automatic processor with 7-min. cycle.

Cine Magnetic News 238

Cine Magnetics. Monthly news letter about latest developments in magnetic film striping techniques.

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508	527	546	565	584	603	622	642	662	682	702	722
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511	530	549	568	587	606	625	645	665	685	705	725
512	531	550	569	588	607	626	646	666	686	706	726
513	532	551	570	589	608	627	647	667	687	707	727
514	533	552	571	590	609	628	648	668	688	708	728
515	534	553	572	591	610	629	649	669	689	709	729
516	535	554	573	592	611	630	650	670	690	710	730
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Laminated Striping 239

Magnon. Data on the potential of a laminated magnetic sound stripe on 8mm and 16mm motion picture film.

Producer Service 240

Byron Laboratories. Illustrated brochure on organization supplying all types of lab and producer services.

Movie Equipment 241

J. Productions Inc. Informative 14-page booklet on JPI services and extensive line of cameras and projectors.

8mm Magnetic Sound 242

Geo. W. Colburn. Ten-page introduction to 8mm sound movie equipment and production.

CarPac 243

Carter Mfg. Co. Data on camera mount that holds two men plus equipment atop the car.

Reversal Film Processor 245

Filmline Corp. Data on the Model R 15 reversal film processor which develops film at 1200′ per hr. Also on other company products.

Splice and Repair 246

Florman & Babb. Info on Magic Mylar for repairing, replacing, butt splicing and strengthening overlap splices.

Animation Stand 247

S.O.S. Cinema Supply. Data on an improved 1961 version of the Tel-Animastand.

GRAPHIC ARTS AND REPRODUCTION

Repro Bulletin #28 249

Andrews Paper and Chemical. The latest Reproduction Paper News Bulletin with special attention to news item on improved airknife.

Speed Easel 250

Ganz. Descriptive leaflet on Sing-L-Size easels.

Tapes 251

Para-Tone Inc. Details on Zip-A-Line tapes for graphic arts field.

Copying System 252

Gevaert. 12-page illustrated booklet solves problems of office reproduction and introduces the Gevacopy aluminum offset plate.

Type Specimens 253

Fototype, Inc. 68-page type specimen book shows 300 type styles available in "set it yourself" alphabets.

Catalog on Cutters 254

Michael Lith. 15-page color catalog with complete specifications on line of paper cutters, trimmers and shredders.

LIGHTING

Copy Camera Lighting 256

ColorTran. Brochure pictures how industrial repro departments have benefited from Linelites.

Reconditioning Process 257

Quartz Radiation. Details about the Nu-Life process which restores burned out mercury vapor lamps.

Arc Lamps 258

Strong Electric Corp. Literature on Grafarc and Challenger fully automatic high intensity arc lamps.

Lighting Equipment 259

Naren Industries. Flyers on new Naren Hy-Lite and Rainbo spots and accessories for display, photography and theaters.

Pocket Size Barndoor 260

Lowel Light. Info on new 4½ oz. barndoor for reflector floods which fold flat and attach without tools.

Studio Lights 262

Hico Corp. Data on a four-light flash setup, model 506/800, designed for studio use.

SERVICES

Color Service 264

Kurshan & Lang. Data on color services available, including dye transfer prints, Ektacolor prints and custom color film processing.

New Wall Chart 265

Bebell & Bebell. Shows prices and types of all color prints including Ektachrome, Ektacolor and giant transparencies.

MISCELLANEOUS

Protection by Projection 268

Gard Electronics. Flyer on photographic protection system which takes 2,000 shots on one 50-ft. magazine.

Microscope Line 269

Elgeet. Full data on two new items – the Elgeet Model SS microscopes, (SS-2 and SS-3) and the Microtar Zoom Microprojection attachment.

X-Ray Reproduction 270

Hospital Picture. Brochure on film or paper prints of X-Rays reproduced by Log-Etronography (electronic dodging).

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MARSHALL

continued from page 48

shaft mounted within a small cylindrical component. The corroded area was located deep within the cylinder, thus making it impossible for the camera to see the area directly.

This was resolved by the use of a small mirror, borrowed from a file clerk's purse. The mirror was inserted into the cylinder and the light reflected from the mirror onto the corroded area. This naturally reflected the image back on the mirror. The camera was focused on the mirror image, and the desired picture was promptly shot!

An all-important and seldom-mentioned workhorse of Marshall's Photo Branch is the copy camera. This facet of the Center's photo arm turns out dozens of copies of charts, graphs and drawings each week. These copies are often shot on color film for reduction to slides.

In the field of component documentation and the assembly of components, photography serves a double purpose. Besides utilizing the motion picture footage recorded during the assembly of rockets, satellites and their components for use in film reports, still photos are used in the compilation of instruction manuals for future assembly. Copies of these phases of rocketry are filed for historic purposes.

Satellites and space vehicle components are tested and evaluated to meet the stringent requirements necessary for successful operation. Photographic coverage is necessary in order to detect any malfunction or error in design. These tests, requiring both regular and high speed film, are invaluable in the determination of any needed modifications or changes in design.

The value of film as an audio-visual aid is evidenced by the number of films in use at Marshall Center for orientation and training purposes. The Center constantly has educational and information films on loan to various schools, universities, clubs, and companies.

Chief's Comments

Responsibility for the Marshall Center's photo operations rests with Sam Hobbs, a veteran photographer with many years of industrial and government experience. Commenting on the capabilities of his group he notes: "We turn out approximately 150,000 feet of motion picture film per month, and about 15,000 still prints. We must maintain a high degree of quality as well as the quantity of photographic coverage necessary to satisfy the requirements of the MSFC." □

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photo briefs

by JILL ENGLISH, *Associate Editor*

4,000 Color Prints Set To Go

RICHARD COLETTI displays one of 4,000 prints of Astronaut ready for mailing.

On the day after Alan Shepard was catapaulted into space *The Washington Post* ran an impressive R.O.P. color picture of him on its front page. The shot was provided by the PR department of the National Aeronautics and Space Administration, who broke with tradition by sending out color rather than black-and-white publicity stills of the newsworthy Astronaut. A fine screen made these prints — sent out to *The Post* and 4,000 other papers across the country — suitable for reproduction in either black-and-white or color.

A new process called Cole-Color and originated by Richard Coletti Associates of Long Island enabled NASA to have these prints made at a fraction of the cost of conventional Type C prints. Working from a 4x5 Anscochrome transparency provided by NASA, Coletti used a special process closely allied to a dye transfer to get a print. The latter part of the duplication operation was done by conventional four-color lithography, with final prints run on a Royal Zenith 23.

Instrumentation Services Offered By California Firm

Benson-Lehner Corp. with its

subsidiary, Data Services, Inc., has recently started a program involving photographic instrumentation services and a camera maintenance plan. Thus they hope to encourage large and small research companies to take full advantage of instrumentation techniques in their projects.

The services, which cover everything from the recording of phenomena through final report preparation, include: consulting site preparation services, camera applications and selection services, camera leasing services, film processing and printing services, and high-speed X-Y plotting services.

In addition, Data Services can supply fully-qualified photo instrumentation engineers and technicians under short or long-term contracts, thus enabling user personnel to meet critical delivery schedules during peak work load conditions, non-recurrent photographic tasks, etc.

These services are applicable for the following scientific processes relying on complex photography: vibration analysis, oscilloscope and radar scope recording, manometer tube recording, fluid dynamic studies, metallurgical structural analysis, missile tracking, airborne fire control analysis and fragmentation.

Another phase of the program involves maintenance of instrumentation equipment, immediately available emergency services from a local service center, as well as equipment updating wherever possible to include design improvements offered by the manufacturers.

Thus the user is offered both maximum insurance against equipment downtime and the services of factory-trained field engineering personnel.

For additional information write: W. E. Brown, Jr., Data Services, Inc., 1832 Franklin St., Santa Monica, Calif.

Home Screen Tests Possible With 8mm Camera

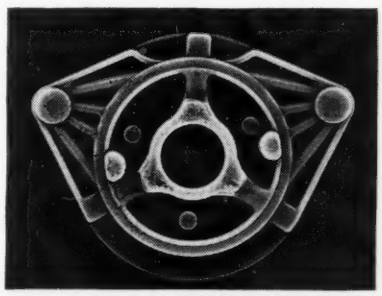
The same company that has campaigned for the use of its 8mm sound camera in industry is now promoting the camera as a means of conducting a do-it-yourself screen test. Fairchild Camera and Instrument Corp. and Warner Brothers are launching a Talent Search competition where contestants film their own screen tests using the Cinephonic 8 camera and submit the reel to Hollywood for judging. This model is sold or may be rented at photo dealers across the country.

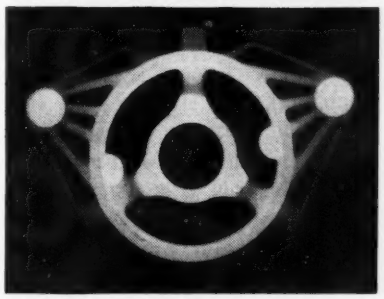
First prize in the contest is a ten-week contract with Warner Brothers.

Viewers See First Telecast Using 8mm Magnetic Film

For the first time in television history home viewers watched a news story which had been completely produced using 8mm magnetic sound film equipment. KPHO-TV of Phoenix, Arizona, the TV Station which accomplished the feat, said it had successfully telecast a 7-minute interview which had been recorded, processed and projected with only slight adaptation using Fairchild Camera's new 8mm sound movie camera equipment.

Casting X-ray





ABOVE, xeroradiograph of a casting. It was made with new xeroradiographic equipments unveiled by Rank Industries at Britain's Industrial Photographic and TV Exhibition and suffers less loss of detail than does a conventional radiograph of same casting (BELOW).

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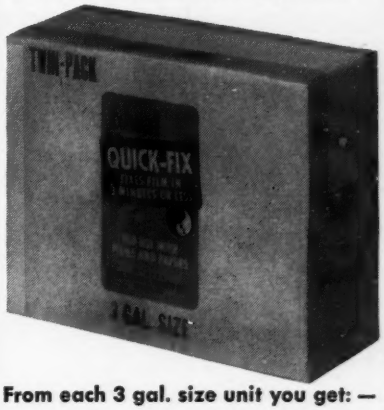

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SUPPORT PHOTOGRAPHY

continued from page 27

towers, others on tripods reinforced with sandbags. Tracking cameras with 20, 40, 80 and 120-inch lenses are spaced at distances from 1,000 yards to a mile from the missile.

Exposure is a major problem. Photographers may have to leave their cameras 70 minutes before blastoff. In that time shooting conditions can alter radically. Many a Cape photographer has sweated out many a drifting cloudbank. Of course, underexposed film can often be brought up in processing, but overexposed film . . . well, that's another problem.

High-speed pan film (ASA 500) is the black-and-white film most often used. In bright sunlight the setting is generally *f*/16 at a thousandth. Night launches are lighted by batteries of million-candlepower searchlights, and apertures are set *f*/11 at 1/400.

At T minus seven seconds all the cameras start snapping and whirring and continue until T plus 20, when the missile leaves their field of view.

Because so much of what space-support photographers are trying to do has never been done before, the men concerned find themselves involved in the research and development of new photographic equipment and techniques as well as in the utilization of existing materials and know-how.

At Edwards Air Force Base in California, the camera is almost as important as the slide rule in assisting engineers to meet their technical challenges. The Photography Branch, consisting of 105 men with 300 cameras, each month shoots a quarter million feet of motion picture film, an average of 500 stills, and use a ton of ingenuity!

One problem confronting Major John R. Lyall's crew related to minute cracks in a rocket engine disclosed by inspection under fluorescent light.

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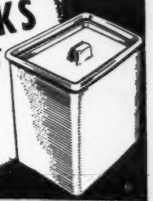

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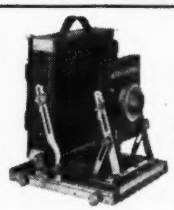

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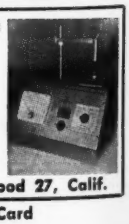

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All efforts to obtain a permanent record of these deficiencies were unsatisfactory. The photographic emulsions were overly sensitive to the ultra-violet light used to fluoresce the material with which the metal was coated. This produced negatives with insufficient contrast to show the subtle difference in tone between the metal and the cracks.

Sarge Leads Attack

The problem was attacked by Technical Sergeant Harold Quiring of the color unit. There was a subtle color difference in the light reflected from the metal and that of the crack. Under ultra-violet "black light," the crack fluoresced in the yellow-green region, while the surrounding metal fluoresced in the blue region of the spectrum.

However, attempts to capture the subtle shades on normal color films with normal procedures were no more successful than previous attempts with black-and-white emulsions. A variety of experiments brought Sgt. Quiring finally to Ektachrome S, which he used at a 12-second exposure although the film was developed for exposures of not less than 1/25th of a second. However, he was not after correct balance, and the shifts caused by failure of the reciprocity law were of no consequence. This film was selected for its response to the yellow-green. Use of this film, plus filtering to depress the blue region, resulted in a peculiar color effect, but clearly brought out the difference in hues, so that the defects were clearly visible. The minuteness of the defects was such that they were visible only under ultra-violet light.

The unit is currently experimenting with fiber-optics, a method of bending light rays through a tube in order to bring an image from a normally inaccessible area to a camera mounted elsewhere.

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EUROPEAN NEWSLETTER

continued from page 38

pictures may be taken and stored within the same tape-length and problems introduced by high-speed tape transports are avoided. Electrostatic tape too, can have a sensitivity comparable with other aerial photography systems.

With their large Sputniks the Russians are probably in a better position to sacrifice convenience and space for improved quality by using a silver halide system. It will be remembered that their moon satellite carried two fairly conventional cameras, (although here the choice was easier as only a handful of pictures were required, as opposed to the regular repetitive coverage of a meteorological satellite).

Exposed film passed into a miniature high temperature processing unit and thence to a picture transmission system. Taking advantage of the permanence of a silver image, the Russians were able to scan and transmit these negatives several times. Extremely slow transmission rates were employed in long range read-out from the vicinity of the moon, and a faster transmission rate used when nearer the earth.

The value of a few suitably oriented meteorological satellites providing between them an accurate world-wide forecasting system would obviously be considerable. However success in this is unlikely to immediately lead to military reconnaissance.

It is one thing to photograph the broad outlines of white cloud tops, and quite another to resolve low contrast detail on the dark toned surface of the earth through an extra 5,000 ft. or so of light-scattering dense atmosphere. This calls for faster film (more susceptible to cosmic radiation); wider aperture lenses (difficult to equate with high resolution), or longer exposures. But, since a super long-focus lens would be necessary, image movement problems would already be acute, even at high shutter speeds.

Bit by bit these enormous technical difficulties in working from space will be overcome. One day photography from man-made satellites will constitute the primary method of military, as well as meteorological reconnaissance.

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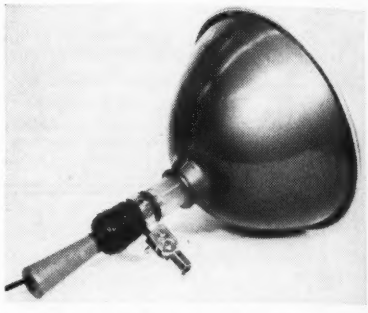
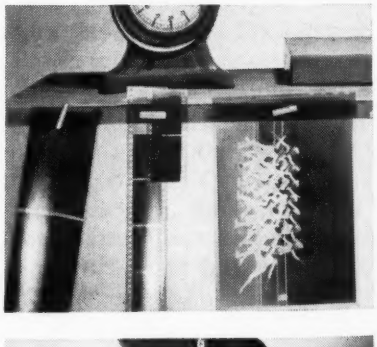


REPLENISHING DEVELOPER

For accurate results in replenishing film developers, it is necessary to keep a record of the number of rolls or sheets of film developed. You can make a handy device for this purpose by stringing up several buttons on a wire or string in your darkroom. I use white buttons with a dark button at every tenth space. After developing film, I just slide over the number of buttons to correspond with the number of rolls of film developed.—*Wayne Floyd, Fayetteville, Tenn.*

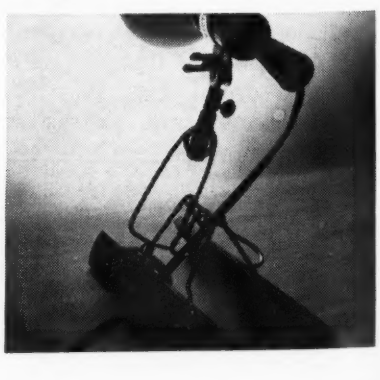
PARKING PLACE

A thin strip of strapping iron attached to a shelf above the enlarger makes a fine parking place for negatives when they are held in place with "pot-holder" magnets. One hand will slip the negative free, while the magnet remains in place. — *William C. Diffenderfer, Miami, Florida.*



A GOOD BASE

The spring clamp-on type of flood lamp holders will not stand alone and require a base of some sort on which to clamp. A pants hanger will make a good base for this type of clamp when used on the floor as a background light or on a table or other support. — *Wayne Floyd, Fayetteville, Tenn.*



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